CERTIFICATION STATEMENT

I hereby certify that Hydrologic Section R645-301-700 was prepared by me or under my direct supervision, and that I am a duly registered professional engineer in the State of Utah. Information, data and conclusions contained within this section to the best of my knowledge are true and correct. Some data and conclusions contained herein have been taken directly from previous permit submittals as prepared by the applicant and are assumed correct. I have no knowledge that such is not the case. Such data and conclusions have been used at times in preparing conclusions for this permit submittal.

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

TABLE OF CONTENTS
HYDROLOGY. R645-301-700.

LIST OF TABLES

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

TABLE OF CONTENTS - (Continued)

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

TABLE OF CONTENTS - (Continued)

TABLE NO. **PAGE NO.**

LIST OF MAPS AND FIGURES

MAP OR FIGURE NO.		REFERENCE PAGE
722.100a	Ground and Surface Water Sampling Locations with Seasonal Water Quality	Page 700-5 of 104
722.100b	Seep and Spring Survey Update	Page 700-6 of 104
722.100c	Ground Water Contours	Page 700-8 of 104
724.100a	Surface and Ground Water Rights	Page 700-16 of 104
Plate 7-1	Surface and Ground Water Rights and Monitoring Points - Sect. 10	Page 700-16 of 104
728.100a	Subsidence Base Map	Page 700-34 of 104
728.100b	Subsidence Survey Location Map	Page 700-34 of 104
731.720a	Valcam Sediment Control Facilities	Page 700-60 of 104
731.720b	Lower Belina Haul Road Sediment Control Facilities - Sheet 1	Page 700-60 of 104
731.720c	Upper Belina Haul Road Sediment Control Facilities - Sheet 2	Page 700-60 of 104
731.720d	Belina Sediment Control Facilities	Page 700-60 of 104
731.750a	Sediment Pond 001A and 002A Survey Details	Page 700-61 of 104
731.750b	Sediment Pond 003A and 004A Survey Details	Page 700-61 of 104
731.750g	Dugout Pond D-1 Design Details	Page 700-61 of 104
731.750c	Pond 001A Stage-Capacity and Discharge Rating Curves	Page 700-64 of 104
731.750d	Pond 002A Stage-Capacity and Discharge Rating Curves	Page 700-65 of 104
731.750e	Pond 003A Stage-Capacity and Discharge Rating Curves	Page 700-66 of 104
731.750f	Pond 004A Stage-Capacity and Discharge Rating Curves	Page 700-67 of 104
731.750h	Dugout Pond D-1-Stage-Capacity Curves	Page 700-67 of 104
742.221a	Dimensionless Curvilinear Unit Hydrograph and Equivalent Triangular Hydrograph	Page 700-71 of 104
742.221b	Twenty-Four Hour Rainfall Distributions	Page 700-72 of 104
742.221c	Variation in Hydrograph Shape with Variation in C_3t_p	Page 700-73 of 104
742.310a	Drainage Basin Boundaries for Selected Large Watersheds	Page 700-86 of 104

R645-301-700. HYDROLOGY.

710 thru 713. INTRODUCTION.

All materials and data requiring certification have been certified in accordance with the requirements of 712 as appropriate. Individual certification statements can be found on the appropriate drawings, at the head of the hydrologic section, and at the beginning of each appendix where required.

Lodestar Energy, Inc. has six sedimentation ponds located within the permit area. Ponds 001A through 004A are of the dirt embankment fill type, Filter Pond 005A (to be removed by surface mining) is a concrete pond and dugout D-1 is an incised bench pond. All sedimentation ponds are not subject to MSHA or CFR 30 and will be inspected quarterly by a qualified individual assigned by the coal company for appearance of structural weakness and other hazardous conditions. All sediment ponds will be inspected annually by a certified professional engineer and an annual summary of such inspection will be provided to the UDOGM and a copy will be retained at the mine office.

Other specifics related to the general requirements of these sections are given in the sections referenced therein.

720. ENVIRONMENTAL DESCRIPTION.

721. GENERAL REQUIREMENTS.

GENERAL SURFACE HYDROLOGY

For purposes of discussion within this hydrology section, the Mine Permit Area has been separated into two distinct areas. The larger of the two areas (referred to in both the geology and hydrology sections as the Belina Permit Area) lies to the west of Pleasant Valley and Mud Creek and contains the majority of the total Mine Permit Area. The second and smaller area is associated with the Valcam Loadout Facility and General Office Area (referred to as the Valcam Permit Area) and is located along Mud Creek. These two areas are shown on Ground and Surface Water Sampling Location Map 722.100a.

The total Mine Permit Area is situated in the headwaters of the Price and San Rafael river basins, with the Carbon-Emery county line marking the watershed divide. The Belina portion of the Mine Permit Area crosses over a total of seven small watersheds. Four of the seven are east facing drainages with the remaining three being west facing drainages. East facing drainages include Eccles Canyon, Boardinghouse Canyon, Finn Canyon, and Long Canyon. West facing drainages include Burnout Canyon, James Canyon and Coal Canyon. The Valcam portion of the Mine Permit Area crosses over a total of four small watersheds. Green Canyon is an east facing drainage and the remaining three (Broads Canyon and two unnamed watersheds) are west facing drainages. Local perennial streams which may potentially be impacted by mining include Upper Huntington Creek, Eccles Creek and Mud Creek. According to previous efforts including the original Technical Assessment completed by OSM and Environmental Impact Statement, Boardinghouse Creek and Whisky Creek are not perennial. At times, much if not all of the flow which is recorded in Whisky Creek originates from within the mine through Filter Pond 005A.

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

Approximately three quarters of the surface water runoff from the total Mine Permit Area drains to the east through Eccles Creek and other smaller tributaries of Pleasant Valley and Mud Creek. These waters pass through Scofield Reservoir before entering the Price River. The remaining area not tributary to Scofield Reservoir drains to the south and west towards the San Rafael River via Upper Huntington Creek and Electric Lake.

Snowmelt is the primary source of water for the perennial streams in the two major drainage basins with summer precipitation usually producing little runoff (U.S. Geological Survey, 1979). Ephemeral streams are also abundant in the Price and San Rafael river basins, existing primarily at lower elevations where evapotranspiration significantly exceeds precipitation.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

VEGETATIVE COVER

The majority of the total Mine Permit Area is covered with the conifer-aspen vegetative type, with a small portion of the land being covered with sagebrush and meadow communities (Bentley et al., 1978). Because of the depth of soil, moderate inherent soil fertility (Rapin, 1977), and high precipitation, the area is abundant in species.

Aspen Communities occur primarily along the ridges and down the drier slopes to the canyon bottoms. Spruce-fir types are present on north facing slopes where evaporation is low due to the low angle of incidence of the sun's rays and on the west facing slopes where the water supply is more abundant due to the westerly dip of the strata. Sagebrush communities fringe and intermix with the aspen type.

Productivity and percent cover over the area appear to be generally high. This vegetative cover benefits the local hydrologic system, according to Storey et al. (1964) by:

1. Building up and maintaining the organic matter content of the soil, thus developing a more open soil structure which increases infiltration and the moisture storage capacity of the soil as well as protects the surface from the erosive forces of runoff and rainfall impact.

2. Keeping the water spread out over the land, thereby slowing runoff and allowing more time for adsorption, resulting in increased infiltration and decreased overland flow (with its attendant erosion and gully formation): and

3. Shading the ground and minimizing wind movement, reducing snowmelt rates and promoting infiltration.

WATER QUALITY

In general, the chemical quality of water in the headwaters of the Price and San Rafael river basins is excellent. However, this quality rapidly deteriorates downstream as the streams cross shale formations (particularly the Mancos Shale) and receive irrigation return flows from lands situated on Mancos derived soils (Price and Waddell, 1973). Within the Price River Basin, for example, Mundorff (1972) reports that the Price River and its tributaries generally have a dissolved solids content of less than 400 milligrams per liter and are of the calcium bicarbonate type within the upper regions of the Price River drainage. This is consistent with data collected by the applicant which is discussed in detail in Section 724. Water originating on or traversing

Mancos shales within lower reaches of the Price river are of a lower quality and are of the calcium-magnesium-sodium-sulfate type. Typical TDS concentrations within these lower reaches in the area of Wellington are approximately 1700 mg/l. Downstream stations such as at Woodside (located approximately 22 miles upstream from the confluence of the Price River with the Green River) have weighted average TDS concentrations generally between 2000 and 4000 mg/l and consist mostly of sodium sulfate type waters. Data from this location confirms a pattern of rapid downstream water quality degradation.

Sediment yield from the upper portions of the two major basins is probably negligible (Mundorff, 1972). According to the U.S. Soil Conservation Service (1975), erosion rates in the Price and San Rafael river basins vary from 0.1 to 3.0 acre feet per square mile per year. The bulk of the sediment yielded each year at the mouths of major rivers comes from limited areas covered with highly erodible shales (Mundorff, 1972) and not in the upper elevations characteristic of the total Mine Permit Area.

722. CROSS SECTIONS AND MAPS.

Cross sections and maps as required are provided in sections 722.100 through 722.500.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

722.100. LOCATION AND EXTENT OF SUBSURFACE WATER.

REGIONAL GROUND WATER HYDROLOGIC SYSTEM

The principle factor controlling the occurrence and availability of ground water in any area is geology. As noted by Price and Waddell (1973), nearly all of the region surrounding the total Mine Permit Area is underlain by rocks of continental and marine origin, consisting predominately of interbedded sandstones and shales. Although some of the sandstones in the region serve as the principal water bearing strata, their ability to yield water for extended periods of time is largely controlled by the existence of relatively impermeable interbedded shale layers, which prevent the downward movement of a significant amount of water.

According the U.S. Geological Survey (1979), ground water in the region exists under water table, artesian, and perched conditions. Water table conditions exist primarily in shallow alluvial deposits along larger perennial streams and in relatively flat lying sedimentary rocks. Artesian conditions exist at greater depths where a confining layer overlies a more permeable member. However, pressures are generally not sufficient to produce flowing wells. Perched or impeded conditions exist where the confining layer lies beneath the water bearing strata.

Because of the high annual precipitation, the Book Cliffs and the adjacent Wasatch Plateau (where the Mine Permit Area is located), act as recharge areas for regional ground water systems (Price and Arnow, 1974). However, only a small portion of the annual precipitation, probably much less than five percent, recharges the ground water supply (Price and Arnow, 1974; U.S. Geological Survey, 1979). Although the depth of water infiltrating through the surface to saturated beds is small (due to the presence of the relatively impermeable shale layers near the surface over much of the area), the total recharge volume from the region is significant because of the areal extent of the zone of recharge.

Price and Arnow (1974) indicate that properly constructed wells in the Price and San Rafael river basins would have only limited yields (normally less than 50 gallons per minute). Wells immediately adjacent to the Mine Permit Area could normally be expected to yield less than 10 gallons per minute. Increased yields could be expected from wells penetrating highly fractured sandstones.

Rocks in the mountainous areas near the Mine Permit Area generally have low specific yields (0.2 to 0.7 percent) and low hydraulic conductivities (Price and Waddell, 1973). The volume of recoverable water in the area is small, averaging less than 600 acre-feet per square mile in the upper 100 feet of saturated rock (Price and Arnow, 1974).

The quality of ground water in the Price and San Rafael river basins deteriorates with the distance downstream much the same as surface water. Dissolved solids contents in ground water often range from less than 250 mg/l near the Mine Permit Area to 3,000 mg/l near the confluence of the rivers with the Green River (Price and Waddell, 1973). This increase in dissolved solids concentration is the result of increased contact of water and rock as travel distance increases. Saline shales contribute the major portion of the dissolved constituents found at lower elevations.

A 1986 report by the USGS (Water-Supply Paper 2246) identifies the Blackhawk Formation and Starpoint Sandstone as the exposed strata in the Valcam Loadout Facility area, with the Starpoint Sandstone exposed west of the Pleasant Valley fault and the Blackhawk Formation exposed east of the Pleasant Valley fault. The general significance of these layers as water bearing strata is discussed in Section 624.

The USGS report (1986) states that during periods of low flow, water in Mud Creek is derived principally from seepage from the Star Point Sandstone and Blackhawk Formation. This report also states that seepage from the Star Point Sandstone along the Pleasant Valley fault contributes significantly to the flow of Mud Creek near Boardinghouse Canyon, upstream from the Valcam Loadout Facility. This information indicates that seepage from this fault is a local source of shallow groundwater in the area. The only specific information about shallow water bearing strata in the vicinity of the Valcam Loadout Facility came from the well log of a well drilled in 1987 by the LDS Church (Water Right No. 2475). This well log is found in Appendix 725.100 and indicates the well intercepted a water bearing layer 11 to 29 feet deep yielding approximately 2 gpm in the 10 inch diameter well.

Information about groundwater levels in the Valcam Loadout Area was obtained from well logs which are included in Appendix 725.100 and are discussed in Section 722.400. The static groundwater levels measured in three wells at the time they were drilled were compared with water levels in Mud Creek. The relationship between the groundwater water and surface water levels leads us to believe that the creek and shallow groundwater are inter-connected, with groundwater flowing toward the creek at a gradient of about 3% to 10%. Elevations of the ground surface at the well locations were obtained from available contour maps. Table 722.100 identifies the well and ground surface information used to calculate the flow gradients.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

TABLE 722.100.
VALCAM SHALLOW WATER TABLE SUMMARY

WR #	WELL OWNER	ELEVATION AT GROUND SURFACE	DEPTH TO WATER (ft)	GROUND-WATER ELEV. (ft)	ELEV. OF ADJACENT MUD CREEK (ft)	DISTANCE TO MUD CREEK (ft)	AVE. GRADIENT (ft/ft)
E722	Valley Camp	7910	75	7,835	7810	250	0.10
91 200	Alpine School District	7960	100	7,860	7835	1000	0.03
E2475	LDS Church	7920	18	7,902	7850	550	0.09

The calculated flow gradients are slightly flatter than or about equal to the slope of the ground surface between the wells and Mud Creek. This relationship between the flow pattern and the topography is typical of a shallow unconfined aquifer. The direction of flow in an shallow unconfined aquifer is usually consistent with the general slope of the surface topography.

SEEPS AND SPRINGS

As an index of ground water hydrologic conditions in the Mine Permit Area, an inventory was made of existing seeps and springs on, and adjacent to the Mine Permit Area during both the low and high flow seasons of 1978 and 1979, and again in the fall of 1990. Water quality and flow data collected at selected seep and spring locations between the respective surveys is presented within Section 724.100. All seep and spring surveys were completed by traversing the area by foot. Each seep and spring location was noted on topographic mapping and discharge and quality data was collected. Based on these data, selected sampling locations were chosen to represent flow, quality, and geographic variations throughout the Mine Permit Area. Current sampling locations for the representative seeps and springs are shown on Ground and Surface Water Sampling Location Map 722.100a. A complete water quality history for each seep and spring identified is presented in Appendix 722.100a, and a more in depth discussion of water quality is presented in section 724. For additional details related to the complete seep and spring inventory taken in the late 1970's, the reader is referred to the 1980 Vaughn Hansen Associates report entitled "Hydrologic Inventory and Baseline Study of the Valley Camp Lease Area and Adjacent Areas, Carbon and Emery Counties, Utah". Because of its voluminous nature, and because additional copies of large mapping associated with the report are no longer available, the 1980 Vaughn Hansen Associates report is not included within the appendices of this MRP. However, a copy of the report is on file with the Utah Division of Oil, Gas & Mining for review by interested parties. Additional data is also available in the 1984 study completed by Cedar Creek Associates entitled "Seep and Spring Inventory and Proposed Seep and Spring Monitoring Program". A copy of this seep and spring inventory is included within Appendix 722.100b.

MAP 722.100a. Ground and Surface Water Sampling locations with Seasonal Water Quality

At the request of UDOGM, an update to these seep and spring inventories was conducted by Hansen, Allen & Luce, Inc. in the month of August, 1990. The results of this effort are summarized on Map 722.100b. The map has been prepared to show field water quality data as

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

collected at each spring site during both the original and 1990 seep and spring inventories. Field data shown includes (where available) spring number, date, flow, air and water temperature, conductivity and pH. It is interesting to note that flow at some of the springs has increased between the seep and spring inventories in spite of current drought conditions. It is also interesting to note that some new springs were also found during the 1990 inventory. These new springs can be identified on Map 722.100b by locating from the data summary those springs for which only 1990 data is available. Analyses of the data include both mapping and numerical techniques.

A survey of the seeps and springs in the Valcam Loadout Facility area will be completed at the same time the seep and spring survey is updated for the Belina Mine Area. This survey is scheduled to be completed during the summer prior to permit renewal (i.e. the summer of 1994 and every 5 years thereafter). Seep and spring baseline data associated with the 1999 Lease Modification have been included in Appendix 722.100d.

MAP 722.100b. Seep and Spring Survey Update

After reviewing the data from the seep and spring inventories it was decided to plot by color all springs which were noted to have an increase in flow versus those which were noted to have a decreased in flow over the period between 1979 and 1990. This was done to investigate whether there was any pattern to the changes in flow which could be attributable to the mining effort. All springs which showing an increase in flow were plotted with a blue marker, those showing a decrease in flow were plotted in red. No correlation to flow variation as a function of horizontal distribution could be identified from the map over the entire Mine Permit Area. A check in the variation of spring flow in the vertical plane was also completed by plotting spring elevations on an X-Y scatter plot. The scatter plot likewise showed no variation between drier and wetter springs as a function of elevation.

A numerical analysis was also made of spring flows for which 1979 and 1990 fall data exist. By limiting the analysis to these springs only, a relative comparison of overall changes in flow was possible. The comparison of fall 1979 to fall 1990 spring flows reveal that there has been an overall decline in spring flow of approximately 33 percent. This drop in flow corresponds relatively closely with the drop in precipitation which has been noted within the Central Utah area over the last few years (See Table 724.411). It must be stated however that these declines are not consistent nor general over the entire area. If the data is broken down into total 1979 (spring and fall) data versus fall 1990 data it is found that there was a 74 percent decrease in flows over the last 10 years. This data is misleading however because of the natural decrease in flows which occurs between the spring and fall seasons. A further breakdown of data utilizing only fall 1979 and fall 1990 data shows that there has in actuality been an overall increase in flows of 245 percent. In the fall of 1979 the total spring flow measured (which was found to be dry in the fall of 1990) was 8.83 gpm. New springs found in the fall of 1990 had a combined flow of 21.6 gpm, hence the 245 percent overall increase or gain in flow. In summary, it appears that changes in spring flows and their locations is occurring over the Mine Permit Area with an overall spring flow decrease of approximately 33 percent. Data shown in Table 724.411 shows precipitation decreases of 38, 46, 36, and 33 percent for the State, Nephi, Coastal States, and Cyprus Plateau stations respectively for the period of record. All of these stations show a decrease in precipitation of roughly the same magnitude as the decrease in spring flows which have been measured within the Valley Camp permit area.

INCORPORATED

OCT 2 6 2001

DIV OF OIL GAS & MINING

As a result of the 1978 and 1979 seep and spring survey completed by Vaughn Hansen Associates, it was determined that there were in excess of 74 seeps and springs located within the Mine Permit Area, as well as 35 located in areas adjacent to the permit boundary. According to the Vaughn Hansen Associates report (1980) there was an average of one water source encountered for every 37 acres, not including perennial streams. Observations and measurements in the area also indicated that the majority of the seeps and springs continued to flow throughout the low flow period of the year. Travel distance between water supplies is therefore relatively short for the wildlife and livestock which utilize the area. The impact that a decrease in water supply resulting from a drought, mining impacts or other causes would therefore be relatively mild since other sources of water are located within the close proximity.

The 1990 seep and spring survey indicates that there were a total of 124 seeps and springs identified in the general permit area. Eighty one (65%) of these springs were flowing, 43 (35%) were dry as compared to 86% flowing and 14% dry in the fall of 1979. Again the decrease in flowing wells is believed attributable to local climatic trends because no patterns have been identified to date which correlate any of the decreases to mining activities.

Several observations should be made regarding the occurrence of seeps and springs in the Mine Permit Area. First, many springs issue near the base of a sandstone lens (where contact is made with a shale member), often a considerable distance (from a few feet to tens of feet) above the adjacent streambed. This indicates that the shale layers in the Blackhawk Formation act a impeding lenses, carrying at least a portion of the water which percolates through the soil mantle back to the surface where it is eventually discharged into an adjacent stream. Thus, because of the presence of a large amount of shale in the Mine Permit Area, ground water recharge is likely slow.

A second observation deals with the origin of the water issuing from the seeps and springs. Note that a number of springs are located at relatively high elevations. This, together with the fact that the sandstone lenses in the Blackhawk Formation are very discontinuous, implies that much, if not all, of the water found in a given spring originates in the small surface depression of basin immediately adjacent to the spring. It is therefore believed that the springs are supplied by a bedrock member which is extremely local in extent, as opposed to a larger, more regional system. The same conditions presumably apply to springs at lower elevations.

A third observation to be made concerning location is that very few seeps and springs appear to be fault related. This phenomenon has also been noted elsewhere along the Wasatch Plateau. As noted by the U.S. Geological Survey (1979), the shale layers of the Blackhawk Formation are bentonitic, tending to swell when wet and decompose into impervious clay. Apparently, fractures in the Blackhawk Formation seal readily because of the ability of the shale layers to swell and decompose, providing a barrier to water movement.

As a final observation, travertine deposits are often associated with springs in the area. Although this may suggest a deeper seated water source than a localized sandstone, Hem (1970) indicates that this may also result from the high calcium bicarbonate content of the water. This explanation is felt to be reasonable, thereby supporting the hypotheses that faults in the

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OCT 2 6 2001

DIV OF OIL GAS & MINING

Blackhawk Formation are not ready conveyors of water. Additional information related water quality of local seeps and springs will be given in section 724.100.

A map estimating localized ground water contours was prepared in September of 1980 based upon data available from both the applicant and from Coastal States Energy reports. Subsequent to that time only limited ground water data has been made available for a contour map update due to 1) the abandonment of local ground water wells which were utilized in the 1980 approximation, and 2) the lack of access to any remaining wells. Map 722.100c was updated in 1993 for areas where information was available. Data were obtained for five monitoring wells in the Coastal States Energy mine area adjacent to the permit area. The available information indicates a small general decline in groundwater levels in this area. Ground water contours for the Valcam Loadout area were added based on the static water levels recorded on well logs for area wells and the elevation of Mud Creek. The elevation of Mud Creek was estimated using contour maps. The elevation 7800' groundwater contour line was estimated using the elevation of Mud Creek and assuming flow gradients approximately the same as surface topography. Note that the contours generally slope to both the east and west with the local ridgeline (and also county line) forming the divide.

Although there are no recent data available from monitoring wells in the Belina Mine permit area, mining impacts on groundwater can be inferred from annual spring flow data. The spring flow data and a discussion of the flow variations are found in the annual Spring Depletion Report completed by HA&L dated December 1, 1992. This report states that most of the variations in spring flows appear to be due to natural flow factors and below average precipitation for the area. The only spring which shows evidence of significant mining impact is located along the northwestern mine permit boundary in the South Fork of Eccles Creek. It is possible that groundwater levels in this area are being impacted by mining on the west side of the fault. With this exception, it is believed that current hydrologic conditions are similar to those found in 1980, and therefore ground water contours should be similar to those identified in the 1980 analysis. The preparation of a map showing seasonal variations in ground water contours is not possible due to a lack of seasonal data.

MAP 722.100c. Ground Water Contours

722.200. LOCATION OF WATER BODIES.

Local surface water bodies located in the vicinity of the Mine Permit Area include three reservoirs and perennial stream channels. As can be seen on Ground and Surface Water Sampling Location Map 722.100a, the largest water body in the general area is Scofield Reservoir which is located approximately three miles north of the Valcam Loadout Facility. Electric Lake, a reservoir built in conjunction with the power generating facility in Huntington Canyon, and Cleveland Reservoir both lie to the south and west of the Belina Mines. Both reservoirs lie in a south, southwest direction from the Belina Mines with Electric Lake being the closest water body at a distance of approximately 4.5 miles from the mine portals, and with Cleveland Reservoir at a radial distance of approximately 6 miles. Electric Lake lies approximately one mile south and west from the far western permit boundary of the Belina Permit Area. All three reservoirs are well known recreation spots and are heavily fished during the summer months. Other local water bodies include perennial streams briefly discussed in section 721, as well as some small unnamed beaver ponds.

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

Irrigation diversions, stock ponds or reservoir uses within the area adjacent to the Mine Permit Area are located on Map 724.100a. A listing of water right owners for each of these diverters is provided within Appendix 722.100c.

722.300. LOCATIONS OF MONITORING STATIONS.

Elevations and locations of monitoring stations used to gather baseline data on water quality and quantity are shown in two locations. Information related to the original seep and spring inventory completed in 1978 and 1979 as discussed in section 722.100 is shown in the original report completed by Vaughn Hansen Associates (1980) and is not reproduced herein due to its voluminous and dated nature. The reader is referred to the original report as referenced for additional details should they be desired. Current surface and ground water sampling locations are shown on Map 722.100a. The locations of the seeps and springs located on the map were identified in the field through visual triangulation and altimeter readings. A brief description of each sampling location along with an explanation as to why it is currently being sampled is given in Table 722.300a.

TABLE 722.300a
CURRENT WATER QUALITY MONITORING STATIONS

STATION	LOCATION	VALUE OF STATION
VC-1	Mud Creek below Valcam Loadout Facility	This station is located not only below the Valcam Loadout Facility, but also below all disturbed mine areas including Coastal States Coal operation. A comparison of data between this station and VC-2 will give an indicator as to impacts of the loadout facility.
VC-2	Mud Creek above Valcam Loadout Facility	This station is located above the Valcam Loadout Facility and is used as a baseline to compare with downstream station VC-1. If UDOGM desired, the data collected could also be compared with VC-5 and VC-10 to determine possible impacts due to other local mining operations.
VC-4	Whisky Canyon Creek above Belina Mines	This station is located above all mining activities and as such can be used as an indicator of downstream mining impacts due to the Belina mines through a comparison of data collected from station VC-5. Station to be moved 280ft upstream to disturbed area boundary due to surface mining impacting previous location.
VC-5	Whisky Canyon Creek below Belina Mines	This station is located at the mouth of Whisky Creek and picks up water quality variations due to mining activities in the Belina area as well as impacts from the coal haul road which accesses the mine.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

STATION	LOCATION	VALUE OF STATION
VC-10	South Fork Eccles Creek above Whisky Creek	This station is located above the point on Eccles Creek where Belina mining impacts could be realized. Data collected and reviewed against Station VC-5 indicates the general comparison of quality between the two steams, and the possible impact to downstream quality through mixing.
VC-11	Boardinghouse Creek	This station serves as an indicator of water quality in neighboring canyons as well as an indicator of the potential impacts to water quality caused by mining. Mining impacts identified at this location would be through the subsurface migration of water from mine tunnels to the surface stream.
VC-12	Finn Canyon Creek above Clear Creek	This station serves as an indicator of water quality in neighboring canyons as well as an indicator of the potential impacts to water quality caused by mining. Mining impacts identified at this location would be through the subsurface migration of water from mine tunnels to the surface stream.
S7-11	Section 7 T14S R7E	This station is identified so as to allow the collection of data related to the migration of subsurface water from the mine area to adjacent areas. It also serves as an indicator of climatic changes and the impact of weather and subsidence on spring flow.
S24-12	Section 24 T13S R6E	This station is identified so as to allow the collection of data related to the migration of subsurface water from the mine area to adjacent areas. It also serves as an indicator of variation noted resulting from climatic changes, and as a gauge of possible, impacts of subsidence on ground water movement.
S25-13	Section 25 T13S R6E	This station is identified as an indicator of the impacts of weather on spring flow. It may also be useful in identifying any potential impacts due to subsidence in areas with heavy geologic cover.
S31-13	Section 31 T13S R7E	This station is identified so as to allow the collection of data related to the migration of subsurface water from the mine area to adjacent areas. It also serves as an indicator of impacts on flow caused by weather changes and adjacent potential subsidence areas.
S36-7	Section 36 T13S R6E	This station is identified to serve as an indicator of changes in flow resulting from climatic changes, and local subsidence.
S36-17	Section 36 T13S R6E	This station is identified to serve as an indicator of changes in flow resulting from climatic changes, and local subsidence.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

S36-19	Section 36 T13S R6E	This station is identified so as to allow the collection of data related to the migration of subsurface water from the mine area to adjacent areas, as an indicator of changes in flow due to climatic fluctuations, and to note impacts caused by local and regional subsidence.
S36-23	Section 36 T13S R6E	This station is identified so as to allow the collection of data related to the migration of subsurface water from the mine area to adjacent areas, as an indicator of changes in flow due to climatic fluctuations, and to note impacts caused by local and regional subsidence.

In conjunction with the incorporation of the 1999 Lease Modification, monitoring at springs SCOAL- 1 and 5 and at stream locations COAL and COX will be added to the quarterly water monitoring (see Plate 7-1 in Section 10 for locations). These samples will be analyzed for the parameters listed on Table 731.211A during both the operational and reclamation periods of mining, beginning in the year 2000. Baseline monitoring data collected for the years 1996 thru 1999 for SCOAL-1 and 5, COAL and COX are located in Appendix 722.100d.

COAL and COX both report to Electric Lake and collect spring flow for the Coal and Cox Canyons. Monitoring site S36-19 is located north of the proposed lease modification, and is included in the current White Oak monitoring plan.

The following sites will be sampled for flow during three quarters in the year 2000 SCOAL-2, 3, 4, 6, 7, 8, 9 and SCOX-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16. The flow data will be added to Appendix 722.100d to compliment the baseline data previously collected.

The current number and location of water monitoring stations has changed throughout the years as the needs of the coal mine and the regulatory agency have changed. A brief description of water quality monitoring stations which have been dropped, along with a clarifier as to why they were dropped is given in Table 722.300b.

TABLE 722.300b
STATIONS DROPPED FROM MONITORING PROGRAM

STATION	YEARS MONITORED	REASON NOT CURRENTLY SAMPLED
CS-1	11/78 - 04/81	Station monitored by Coastal States Energy.
CS-7	11/78 - 09/79	Station monitored by Coastal States Energy.
S-1	09/83 - 06/84	Located within channel bottom and is impacted by stream flow.
S25-1	08/83 - 12/83	Inaccessible through much of year
S25-2	09/83 - 06/84	Inaccessible through much of year
S25-6	09/83 - 06/84	Inaccessible through much of year

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

S32-3	10/83 - 06/84	Springs owned and operated by Scofield City and are inaccessible to sampling because of the removal of sampling overflow pipes.
UPL-3	07/74 - 08/79	Maintained by Utah Power and Light.
UPL-10	06/78 - 08/79	Maintained by Utah Power and Light.
VC-001*	09/77 - 10/83 10/01	Number changed to UPDES No. 005A located at Filter Pond 005A discharge. UPDES No. 005A will become the discharge of Dugout D-1.
VC-002	09/77 - 05/78	Pumping halted out of mine workings. No longer discharging.
VC-3	12/75 - 06/77	Mine water no longer discharging.
VC-3A	08/75 - 06/78	Mine water no longer discharging.
VC-6	06/76 - 07/87	Station monitored by Coastal States Energy.
VC-7	01/76 - 11/76	Impacts noted at this station are better detected at Station VC-11.
VC-8	01/76 - 06/77	Impacts noted at this station are better detected at Station VC-12.
VC-9	01/76 - 04/81	Station monitored by Coastal States Energy.
VC-13	02/80 - 06/84	Station outside probable area of impact for this permit period.
VC-14	04/80 - 06/84	Total mining impacts of the Belina mines is better recorded at station VC-5.
W19-1	12/79 - 06/84	This well now provides culinary water to the bath house. Opening the well to collect a water level sample could create a health threat to those who now depend upon the supply.

* Now UPDES Discharge Station 005A.

722.400. LOCATION AND DEPTH OF WATER WELLS.

Three wells have been drilled by the applicant in the permit area, two at the Valcam Loadout Facility and one on the south side of Whisky Creek near the Belina mine. The first well was drilled in 1974 near the bottom of the undisturbed area bypass ditch UDD-1 in the Valcam Loadout area. The second well, a replacement well for the first well, was drilled in 1975 about 180 feet northeast of the first well. The purpose of these two wells was to supply culinary water and both are associated with water right number E772. The first well was abandoned after completion of the second well. The abandoned well will be sealed, according to the methodologies presented in Section 600, when the mining area is reclaimed.

The third well was drilled in 1980 on the south side of Whisky Creek near the downstream slope of Sediment Pond 004A. The third well is currently used for a culinary water supply and is associated with water right E1058. Appendix 725.100 already contained the well drillers reports for the wells drilled in 1975 and 1980. A well drillers report along with a well log for the well drilled in 1974 was obtained and added to Appendix 725.100. A well log for the well drilled in 1975 was obtained and added to the well drillers report in the Appendix. Map 722.100c was updated to show the locations of two wells at the Valcam Loadout Facility.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

Two wells have been drilled by others near the Valcam Loadout Facility. These wells were drilled in 1953 by Utah Natural Gas Co. and in 1987 by the LDS Church and are associated with water rights 91-3460 and 91-200, and water right E2475, respectively. The well drilled in 1953 is currently owned by the Alpine School District and supplies water for domestic and irrigation uses. The well drilled in 1987 is still owned by the LDS Church and supplies water for domestic use at their facilities near the Valcam Loadout. Appendix 725.100 contains the well logs for these wells. Map 722.100c was updated to show the locations of these two wells.

Two wells, W17-1 and W17-3, have been drilled in the mouth of Eccles Canyon by Coastal States Energy Co. (It should be noted that the well designated as W17-1 on Map 722.100c has been renamed W17-3. Another well, previously not shown on Map 722.100c, has been added and designated as well W17-1. These changes make Map 722.100c consistent with the well names designated in the Coastal States Energy Permit and with this text.) Wells W17-1 and W17-3 were drilled in 1981. Water rights records indicate that water rights E1560 and E1906 apply to well W17-3. There is no record of any water rights currently associated with well W17-1. The text of Coastal's permit indicates that these wells were used for culinary water supplies and that well W17-1 was drilled to determine the aquifer characteristics of the Starpoint Sandstone which it penetrates. A well drillers report for well W17-1 is included in Appendix 725.100. Neither a well log nor well drillers report was available for well W17-3.

There are three wells in the upper third of Eccles Canyon, W13-2, W13-1, and W24-1, owned by Coastal States Energy Co. A well drillers report for well W13-2 was obtained and added to Appendix 725.100. The well drillers report indicates that the well W13-2 was drilled in 1981. Water right records show that well W13-2 is associated with water right E1114. No drill logs or water rights information was located for wells W13-1 and W24-1. The text of Coastal's permit indicates that well W13-1 was drilled to supply culinary water and to determine the aquifer characteristics of the Starpoint Sandstone which it penetrates, but it was abandoned because of insufficient flow. Well W24-1 is described as a culinary well in Coastal's permit but a well log and water right information could not be located for this well. The locations for these two wells were added to Map 722.100c based on the locations scaled from a Map in Coastal States Energy's permit.

Table 722.400a lists all wells in the Valcam Loadout and Eccles Canyon area for which well logs are available. Additional and information about the hydrogeologic well settings can be found in the well logs in Appendix 725.100.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

TABLE 722.400a.
LOCAL WELL DEPTH AND WATER RIGHT SUMMARY

WELL OWNER	YEAR DRILLED	DEPTH (FT)	WATER RIGHT NO.'S
Alpine School District[1]	1953	280	91-3460 91-200
Robert Radakovich	1972	140	E452
Valley Camp Coal Co.	1974	200	E772
Valley Camp Coal Co.	1975	210	E772
Valley Camp Coal Co.	1980	730	E1691
Coastal States Energy Co. (W17-1)	1981	200	none[2]
Coastal States Energy Co. (W13-2)	1981	1050	none[2]
Scofield City	1982	260	E1934
LDS Chruch	1987	220	E2475

Notes: 1) The original well owner was Utah Natural Gas Co.
2) There are currently no water rights associated with these wells

During the summer of 1979, Coastal States Energy Company drilled several coal exploration holes on the Skyline Property (located adjacent to the northwestern border of the Mine Permit Area). Five of these locations were selected for conversion to ground water observation wells. Deep observation wells (terminating in the Star Point Formation) with 2-inch casing were installed at each of the five locations. Shallow observation wells (terminating in the Blackhawk Formation, normally above the coal zone) with 2-inch casing were installed at four locations. The casings were perforated throughout the bottom 20 feet, thus providing a measure of the piezometric heads in the respective formations and a determination of whether or not vertical movement was occurring. Since these wells penetrate the same geologic formations that underlie the Mine Permit Area, and because of their proximity to the Mine Permit Area, information obtained gives some indication of aquifer and ground water characteristics in the Mine Permit Area.

Detailed information for the monitoring wells on the Skyline Property can be found in the Coastal States Energy Permit. A brief summary of this information is shown below in Table 722.400b.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

TABLE 722.400b.
OBSERVATION WELL DATA SUMMARY

OBSERVATION WELL NO.	COLLAR ELEVATION GROUND	TOTAL DEPTH CASED (FT)	PERFORATIONS	FORMATION MONITORED
79-10-1A	9382.8	1110	Bottom 20'	Blackhawk
79-14-2A	9051.7	122	Bottom 20'	Blackhawk
79-22-2-1	9040.0	585	Bottom 20'	Blackhawk
79-26-1	9012.0	200	Bottom 20'	Blackhawk
79-35-1A	8726.4	1000	Bottom 20'	Starpoint

Combined information from both the applicant and Coastal States Energy wells have given a fair amount of information related to ground water and aquifer characteristics.

722.500. SURFACE CONFIGURATION.

A 1980 report prepared by Vaughn Hansen Associates indicated that slopes on the Mine Permit Area vary from greater than 75 percent (37 degrees) near the Carbon-Emery County line to less than 2 percent (1.2 degrees) along the bottom of Pleasant Valley Canyon. The average slope over the area is approximately 28 percent (16 degrees) as determined from a 1:24,000 scale map. Because of the ridgetop location of the property and the variety of channelized flow directions, aspects also vary greatly. However, the Carbon County side of the property does have a dominant aspect to the east. The topography is rugged, with elevations ranging over the Mine Permit Area from about 7840 to 10,044 feet above mean sea level.

The White Oak Complex will be completed through the use of surface mining methods. The area surrounding and including the White Oak Complex consists of moderately steep to steep mountain slopes near the head of a drainage. Slopes range from 20 to 50 percent and the elevation ranges from about 8,975 to 9,200 feet.

Mapping within this section of the Mine Permit is provided at a scale of one foot to 100 feet.

723. SAMPLING AND ANALYSIS.

All water quality analyses are conducted according to the methodology in the current edition of "Standard Methods for the Examination of Water and Wastewater" or the methodology in 40 CFR Parts 136 and 434. Water quality sampling is also performed when feasible to met the requirements of the same.

A water quality monitoring program has been established by the applicant whereby data is collected and analyzed. The sampling program includes a comprehensive and abbreviated data collection schedule according to the discussion provided in Section 731.211.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

724. BASELINE INFORMATION.

724.100. GROUND WATER INFORMATION.

Information related to ground water depths and vertical distribution of water as required under this section is presented within numerous sections of this permit. A discussion relating ground water and geology can be found in section 624.100. A cross section of the approximated ground water level is also shown in conjunction with a geologic cross section taken from well log data on Geologic/Hydrologic Cross Section Maps 622.200j through 622.200m. Ground water contours showing overall aerial extent and general shape of the ground water table is discussed in section 722.100, and shown on Ground Water Contour Map 722.100c.

GROUND WATER RIGHTS

An extensive survey of ground water rights for the general vicinity was completed in 1980 by Vaughn Hansen Associates. At the request of UDOGM the water right survey completed in 1980 was updated during the spring of 1990 by Hansen, Allen & Luce, Inc. The information obtained during the update was obtained by computer hookup to the State Division of Water Rights computer. Water rights identified in this manner are presented on Surface and Ground Water Rights Map 724.100a and Plate 7-1 in Section 10 for the mine permit and adjacent areas. The map indicates through symbols which rights are associated with wells and mine water, as well as those associated with local springs. Details related to owner, source, flow, purpose of use, and period of use are documented in Appendix 722.100c. The water right data as given in the appendix is presented as obtained from the Division of Water Right computer.

Water right data obtained from the State water rights computer indicates that there are a total of 112 spring and 23 well and tunnel rights in the general vicinity of the Mine Permit Area. Of the total 135 ground water rights, fifteen are exchanges or temporary filings. Sixty two of the 135 ground water rights are declared to be associated strictly with stockwatering while the intended use on 32 of the rights is undeclared. Other uses identified in the filings have varied and mixed uses and make up the balance of ground water rights. A summary of water right uses as declared for each individual surface and ground water right is given in Table 724.100a. Water rights associated with the 1999 Lease Modification are shown on Plate 7-1, in Section 10.

MAP 724.100a. Surface and Ground Water Rights
Plate 7-1. Surface and Ground Water Rights and Monitoring Points - Section 10

GROUND WATER QUALITY

SPRINGS

Ground water quality data has been collected from selected springs in the Mine Permit Area. Seasonal water quality for selected water quality parameters (anions and cations) for each of the springs identified is also shown on Ground and Surface Water Sampling Locations Map 722.100a. The water quality sampling schedule used for data collection from these sources is discussed in Section 723. Springs currently being monitored by the applicant include those identified on the map as S7-11, S24-12, S25-13, S31-13, S36-7, S36-17, S36-19, and S36-23.

Little water quality data is available for the identified springs during the first quarter of the year due to inaccessibility of the spring site. Generally speaking, the earliest that flow and quality data can be collected is during the month of May for dry years, and as late as June or July for wet years. Of the springs sampled, only one has first quarter data available during the period of record.

The anion-cation diagrams shown on "Ground and Surface Water Sampling Locations with Seasonal Water Quality" Map 722.100a have been developed based upon average quarterly data for the period of record through May, 1990. The anion-cation diagrams indicate that the water quality during the second quarter is generally of the highest quality, with a slight deterioration occurring in the third and fourth quarters. First quarter data is not available. Spring water is strongly of the calcium bicarbonate type and generally has TDS values in the 200 to 300 mg/l range. The lowest average TDS is recorded at station S36-19 which drains into Huntington Creek. The highest average TDS (374 mg/l) is shown to occur at station S24-12 during the fourth quarter of the year. Water quality statistics for each of the identified stations is included in Table 724.100b.

TABLE 724.100a.
WATER RIGHT USE SUMMARY

DECLARED USE	SPRINGS		WELLS/ TUNNELS	SURFACE WATER		
	BASE RIGHT	EXCHANGE/ TEMPORARY	BASE RIGHT	EXCHANGE/ TEMPORARY	BASE RIGHT	EXCHANGE/ TEMPORARY
Irrigation	2	-	-	-	25	
Irrigation, Stock	1	-	-	-	1	-
Irrigation, Domestic, Other	-	-	2	-	-	-
Irrigation, Domestic, Stock, Other	1	-	-	-	-	-
Irrigation, Domestic, Stock, Municipal, Other	-	-	-		1	-
Stockwatering	61	-	-	1	106	-
Stockwatering, Other	-	-	-	1	-	-
Domestic	8	1	-	2	1	-
Domestic, Stockwatering	3	-	1	-	2	-
Domestic, Other	-	-	3	-	-	-
Municipal	1	-	-	1	1	-
Power	-	-	-	-	1	-
Mining	-	-	1	1	-	-
Other	2	1	2	7	-	1
Undeclared	31	-	1	-	55	-
TOTAL	110	2	10	13	193	1

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OCT 2 6 2001
DIV OF OIL, GAS & MINING

TABLE 724.100b
SEASONAL GROUND WATER QUALITY STATISTICS THRU 4/90

STATION	PARAMETER	QUARTER	NO. SAMPLES	MIN VALUE	MAX VALUE	AVERAGE VALUE	STANDARD DEV.
S7-11	Flow	1	0	-	-	-	-
		2	4	0.001	0.078	0.024	0.032
		3	11	<0.001	0.010	0.003	0.003
		4	3	0.001	0.002	0.001	<0.001
	TDS	1	0	-	-	-	-
		2	4	86.0	180.0	132.3	43.9
		3	12	146.0	351.0	241.6	58.1
		4	3	219.0	252.0	238.0	13.9
	pH	1	0	-	-	-	-
		2	4	6.7	8.7	7.7	0.7
		3	12	6.8	8.6	7.5	0.6
		4	3	6.6	8.6	7.5	0.8
	Fe (Tot)	1	0	-	-	-	-
		2	1	0.100	0.100	0.100	-
		3	7	0.025	0.660	0.369	0.212
		4	1	0.350	0.350	0.350	-
	Mn (Tot)	1	0	-	-	-	-
		2	3	0.010	0.010	0.010	<0.001
		3	8	0.001	0.034	0.018	0.012
		4	3	0.010	0.020	0.013	0.005
S24-12	Flow	1	1	0.002	0.002	0.002	-
		2	9	<0.001	0.014	0.004	0.004
		3	14	<0.001	0.010	0.003	0.002
		4	6	0.001	0.004	0.003	0.001
	TDS	1	1	268.0	268.0	268.0	-
		2	9	136.0	360.0	306.8	67.6
		3	13	299.0	506.0	372.6	58.9
		4	5	315.0	418.0	373.6	36.7
	pH	1	1	7.4	7.4	7.4	-
		2	9	6.9	8.0	7.5	0.4
		3	14	7.1	8.3	7.6	0.4
		4	6	6.5	8.6	7.5	0.6
	Fe (Tot)	1	1	0.020	0.020	0.020	-
		2	2	0.120	0.360	0.240	0.120
		3	7	0.014	0.330	0.154	0.104
		4	3	0.150	6.270	2.317	2.800
	Mn (Tot)	1	1	0.010	0.010	0.010	-
		2	7	0.010	0.075	0.019	0.023
		3	8	0.004	0.045	0.014	0.013
		4	5	0.010	0.260	0.065	0.098

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

S25-13	Flow	1	0	-	-	-	-
		2	10	0.003	0.090	0.040	0.031
		3	13	0.001	0.004	0.002	0.001
		4	5	0.001	0.020	0.006	0.007
	TDS	1	0	-	-	-	-
		2	11	44.0	360.0	141.8	102.2
		3	13	135.0	297.0	196.3	40.2
		4	5	70.0	222.0	181.4	56.5
	pH	1	0	-	-	-	-
		2	11	6.8	7.9	7.4	0.3
		3	13	7.0	8.3	7.6	0.4
		4	5	6.9	8.8	7.7	0.8
	Fe (Tot)	1	0	-	-	-	-
		2	4	0.300	4.290	1.378	1.683
		3	7	0.025	0.480	0.198	0.148
		4	3	0.220	0.680	0.477	0.192
		1	0	-	-	-	-
	Mn (Tot)	2	9	0.010	0.110	0.026	0.031
		3	8	0.001	0.110	0.027	0.035
		4	5	0.010	0.020	0.014	0.005
S31-13	Flow	1	0	-	-	-	-
		2	7	0.007	0.030	0.015	0.008
		3	13	0.001	0.100	0.012	0.026
		4	4	0.001	0.006	0.003	0.002
	TDS	1	0	-	-	-	-
		2	7	152.0	272.0	224.7	36.6
		3	13	236.0	395.0	285.0	42.5
		4	4	256	306	275	23.4
	pH	1	0	-	-	-	-
		2	7	6.9	7.8	7.6	0.3
		3	13	6.6	8.0	7.4	0.4
		4	4	6.9	8.5	7.5	0.6
	Fe (Tot)	1	0	-	-	-	-
		2	2	0.060	0.110	0.085	0.025
		3	7	0.010	0.240	0.107	0.088
		4	2	0.040	0.065	0.053	0.013
	Mn (Tot)	1	4	256.0	306.0	275.0	20.2
		2	0	-	-	-	-
		3	6	0.001	0.010	0.009	0.003
		4	8	0.001	0.014	0.009	0.004
			4	0.001	0.012	0.008	0.004

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

S36-17	Flow	1	0	-	-	-	-
		2	11	0.004	0.090	0.024	0.027
		3	12	<0.001	0.090	0.013	0.024
		4	6	0.004	0.040	0.020	0.015
	TDS	1	0	-	-	-	-
		2	11	192.0	298.0	230.6	26.5
		3	13	220.0	287.0	243.3	17.5
		4	6	231.0	267.0	246.8	11.7
	pH	1	0	-	-	-	-
		2	11	7.4	8.1	7.6	0.2
		3	13	6.7	8.6	7.6	0.5
		4	6	7.0	7.8	7.5	0.3
	Fe (Tot)	1	0	-	-	-	-
		2	4	0.050	0.390	0.220	0.143
		3	7	0.050	0.320	0.151	0.092
		4	4	0.065	0.210	0.119	0.055
	Mn (Tot)	1	0	-	-	-	-
		2	9	0.003	0.020	0.010	0.005
		3	8	0.001	0.027	0.011	0.008
		4	6	0.003	0.010	0.009	0.003
S36-19	Flow	1	0	-	-	-	-
		2	8	0.004	0.035	0.013	0.010
		3	13	0.001	0.008	0.003	0.002
		4	2	<0.001	0.001	0.001	0.001
	TDS	1	0	-	-	-	-
		2	8	58.0	170.0	110.1	32.9
		3	13	124.0	655.0	198.6	136.8
		4	1	163.0	163.0	163.0	-
	pH	1	0	-	-	-	-
		2	8	7.2	8.7	7.6	0.5
		3	13	6.8	8.1	7.5	0.4
		4	1	7.0	7.0	7.0	-
	Fe (Tot)	1	0	-	-	-	-
		2	2	0.070	0.160	0.115	0.045
		3	7	0.034	1.350	0.366	0.430
		4	0	-	-	-	-
	Mn (Tot)	1	0	-	-	-	-
		2	7	0.010	0.020	0.011	0.003
		3	8	0.001	0.020	0.011	0.007
		4	1	0.010	0.010	0.010	-

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

S36-23	Flow	1	0	-	-	-	-
		2	10	0.008	0.018	0.012	0.003
		3	15	0.001	0.170	0.021	0.041
		4	7	0.007	0.010	0.008	0.001
	TDS	1	0	-	-	-	-
		2	11	176.0	249.0	204.3	24.9
		3	13	230.0	336.0	267.9	35.8
		4	6	229.0	290.0	247.5	20.0
	pH	1	0	-	-	-	-
		2	10	7.2	8.1	7.5	0.3
		3	14	6.8	7.6	7.2	0.3
		4	7	6.8	7.7	7.3	0.3
	Fe (Tot)	1	0	-	-	-	-
		2	3	0.100	0.500	0.237	0.186
		3	7	0.049	0.244	0.140	0.069
		4	4	0.020	0.114	0.066	0.035
	Mn (Tot)	1	0	-	-	-	-
		2	8	0.001	0.020	0.010	0.005
		3	8	0.002	0.020	0.010	0.005
		4	6	0.005	0.022	0.011	0.005

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

MINE DISCHARGE

Current mining operations are resulting in the discharge of in-mine waters as granted by UPDES discharge permit number at the Belina Mines. Before being discharged into Whisky Creek, water from active areas of the Belina mines pass through Filter Pond 005A. Water from abandoned areas of the mines discharge directly into Whisky Creek as granted in 1986 through the use of a 6 inch bypass line. The letter granting State approval of the discharge is presented in Appendix 750 along with the UPDES discharge permit for the mining operation. According to the letter, the Utah Water Pollution Control Committee "...determined that the proposed alteration basically conforms with the State Wastewater Disposal Regulations." Although no discharge has occurred over the past few years, Valley Camp agreed with DEQ in a phone conversation held to clarify the issue on February 8, 1993, that they would monitor any flow from this area at the time of future initial discharge to confirm that the water quality still meets discharge regulations compatible with Filter Pond 005A. DEQ further clarified that no ongoing sampling was, or is required at this station since no UPDES Point Discharge Permit was issued by the State following its initial investigation.

Water quality data for the discharge waters (UPDES discharge location 005A) is submitted regularly to the regulatory agency and is not reproduced herein. However, summary statistics of basic water quality parameters for the period between January 1981 and June 1989 are given in Table 724.100c.

The original data for the parameters shown in the above referenced table were reviewed in order to determine potential mining impacts upon surface water quality resulting from mine discharges. A review of said data indicates the following noted variations.

The total number of recorded values for total iron ranging between 1.0 and 5.0 mg/l have decreased over the last four years. Prior to the fall of 1985, there are 25 samples that are noted to have total iron concentrations that exceeded 1.0 mg/l. Since that time, only three such values have been noted, with the maximum being 2.2 mg/l as recorded in January of 1988. Similarly, total suspended solids appear to have experienced an overall decrease in concentrations.

TABLE 724.100c
MINE DISCHARGE WATER QUALITY AND FLOW DATA SUMMARY
January 1981 through June 1989

STATISTIC	FLOW (CFS)	TDS (MG/L)	TSS (MG/L)	PH	IRON (MG/L)	OIL & GREASE
No. of Samples	79	236	242	225	229	211
Minimum	0.00	176.00	0.10	6.70	0.01	<0.01
Maximum	0.94	1190.00	217.00	9.70	4.60	<78.60
Average	0.19	463.77	24.07	7.72	0.56	<2.19
Std Deviation	0.26	124.66	28.30	0.32	0.80	<5.80

According to available data, oil and grease concentrations have increased over the eight and a half year period of record summarized above. The increase appears to have occurred during September 1985. Prior to that time, concentrations were generally recorded in the less than 0.5 mg/l range with a few minor exceptions. However, subsequent to that time, more concentrations have been recorded above the 0.5 mg/l value. During the last four years, only one sample (taken February 21, 1986) indicated a concentration value greater than 10 mg/l. The exact reasons for the overall increase in oil and grease at Filter Pond 005A are not known at this time, however, the applicant will continue to monitor concentrations for future trends through the regular monitoring program outlined in this MRP.

No identifiable trends are noted for total dissolved solids, pH, or flow with the exception for flow noted in Section 728.100.

724.200. SURFACE WATER INFORMATION.

The name and location of local surface water bodies is discussed in section 722.200 and shown on Map 722.100a. Of these surface water bodies, the only streams identified as being impacted directly by mining operations include Eccles Creek, Mud Creek and Whisky Creek. Whisky Creek receives discharge water directly from 1) the Belina Mines through Filter Pond 005A (when the mine is discharging), (Filter Pond 005 to be removed during surface mining operations) and 2) potential discharges from Sediment Pond 004A and dugout D-1. Eccles Canyon Creek receives surface water runoff indirectly through Whisky Creek, and directly from surface water runoff originating on the coal haul road accessing the Belina Mines. Mud Creek receives potential discharges from Sediment Ponds 001A, 002A and 003A. All six pond discharges are governed and controlled under UPDES discharge permit number UT-0022985. The referenced permit (granted under a minor Industrial Use classification) became effective August 19, 1992 and continues through August 31, 1997.

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As stated earlier in Section 721 of this permit, local area perennial streams generally include Upper Huntington Creek, Eccles Creek and Mud Creek. Some attempts are being made to reclassify Boardinghouse Creek as a perennial stream due to low seep flows found within the extreme headwaters of the drainage. However, the original TA and EIS prepared for the Permit Area classified Boardinghouse Creek as an Ephemeral stream. Whisky Creek is not included within this classification because Station VC-4 (located immediately above the mine) dries up periodically. This station will be moved 280 ft up the drainage because of the surface mining operation will impact the previous location. As a result, flow entering Eccles Creek below the mine is at times made up of mine discharge water. All other streams in the area are believed to be ephemeral in nature. According to Utah Water Pollution Control Committee standards, all surface waters located within the headwaters of the Price River are classified as Class 1C, Class 3A, and Class 4 type waters. The definition of water classifications is given below.

Class 1A: Indicates waters which are protected for domestic use with prior treatment by treatment processes as required by the Utah Department of Health.

Class 3A: Indicates water that is protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.

Class 4: Water is protected for agricultural uses including irrigation of crops and stock watering.

SURFACE WATER RIGHTS

As indicated earlier in Section 722.100, an extensive surface water right survey was originally completed for the Mine Permit Area in 1980 by Vaughn Hansen Associates. In response to this MRP, and at the request of UDOGM, an update to the 1980 water right survey has been made. Surface water rights identified as a result of the updated survey are identified on Surface and Ground Water Rights Map 724.100a, and listed in Appendix 722.100c. Map 724.100a has been prepared to allow for a correlation between the location of identified water rights and the current Mine Permit Boundary. The identified map indicates through symbols the point of diversion associated with each water right. Surface water rights for the Mine Permit Area are used for a variety of uses including irrigation, stock watering, domestic, power and other use classifications. A breakdown of right uses is given in Table 724.100a. As noted in the table, the great majority of surface water rights (106) are used for stock watering purposes, 25 rights are declared as irrigation rights, 8 water rights have mixed uses, and 55 of the total 193 rights do not declare the intended use of the water. Water rights associated with the 1999 Lease Modification are shown on Plate 7-1, in Section 10.

SURFACE WATER QUALITY

The quality of waters in the vicinity of the Mine Permit Area are generally of the calcium bicarbonate type as shown in the seasonal anion-cation diagrams shown on Map 722.100a. There are currently seven surface water monitoring stations that have been used for the collection of water quality data. These stations include VC-1, VC-2, VC-4, VC-5, VC-10, VC-11, and VC-12. The water quality monitoring schedule for these stations was presented in Section 723. Station VC-4 monitors the quality of water in Whisky Creek above the point of mine discharge 005A, Dugout D-1 and Sediment Pond 004A. Station VC-5 monitors the flow in Whisky Creek below both the mine and pond discharges before entering Eccles Creek. Stations

VC-10, VC-11, and VC-12 monitor the quality of water at the mouths of South Fork, Boardinghouse and Finn Canyons respectively. Stations VC-1 and VC-2 monitor the water at locations above and below areas impacted by the Valcam Loadout Facility.

Surface facilities constructed within the permit area have the potential for impacting water quality through increased chemical or sediment loading concentrations. As an aid in determining impacts to local water quality, the approximate dates of construction have been identified for major construction efforts associated with the mine. In 1974 work was completed at the Valcam Loadout Facility including the construction of various structures and Pond 001A. At that time, Pond 001A was constructed as a mine discharge pond, however between 1975 and 1976 the mine was shut down and the pond was subsequently modified for use as a surface water runoff and sediment control pond for which it is still used today. In 1975 Sediment Ponds 002A and 003A were installed along with the construction of the present Belina haul road (dirt base) and enlargement of the lower mine pad at the Belina mine. The upper Belina mine pad was installed the following year in 1976. Mining began at the Belina #1 mine soon after the installation of the fan house in 1976. The next related construction to occur was completed in 1980 when Sediment Pond 004A and Filter Pond 005A were installed and mining began in the Belina #2 mine. Subsequent to that time, the only major modification has been the hard surfacing of the Belina Haul Road which occurred in 1983. Throughout all these construction related activities, little if any long term variation in water quality has been noted.

Anion-cation diagrams have been prepared for each quarter of the year for all surface water quality stations as shown in Map 722.100a. The diagrams have been prepared using average quarterly data for the stations shown for the entire period of record through May, 1990. After a review of historical data it was found that little if any trends exist in the water quality data. Because trends were not found to be limiting, averages of all data were calculated and used in the preparation of statistical and graphic diagrams (as opposed to taking only the last five years). All surface stations have data available for all four quarters of the year with the exception of stations VC-4, VC-11, and VC-12. Data for the first quarter is not available for these stations due to snow cover and general inaccessibility of the site early in the year.

A study of the variations in the anion-cation diagrams has identified a few interesting correlations. Generally speaking, the highest quality surface water is found during the second quarter period of the year when runoff from snowmelt is the highest. The diagrams shown on the map indicate a slight increase in anion-cations throughout the year. Stations VC-1 and VC-2 located lower in the system near the Valcam Loadout Facility show relatively constant water quality throughout the year.

Relatively speaking, the water quality of the surface waters is good with total dissolved solids ranging from a low 101 mg/l at station VC-4 during the second quarter to a high of 598 mg/l at station VC-5 near the Belina Mines. TDS values (as with overall water quality) generally increases in the third and fourth quarters of the year. Quarterly water quality statistics as required under the regulations for each surface water station are given in Table 724.200a.

724.300. GEOLOGIC INFORMATION.

Detailed geologic information as required under this section is given in Section 600.

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724.310. PROBABLE HYDROLOGIC CONSEQUENCES.

Geologic information given in Section 624 is provided in sufficient detail to determine the hydrologic consequences of the mining operation. Details related to hydrologic consequences are discussed in Section 728.

724.320. RECLAMATION & HYDROLOGIC BALANCE.

Geologic information given in Section 624 is provided in sufficient detail to determine 1) whether reclamation of the Mine Permit Area can be accomplished, and 2) whether material damage to the hydrologic balance outside the Mine Permit Area is prevented. Reclamation designs and plans are submitted as part of this permit within Section 750. Reclamation design details provided as part of this submittal indicate mine disturbance boundaries which will be honored during the reclamation phase of the mining operation.

TABLE 724.200a
SEASONAL SURFACE WATER QUALITY STATISTICS THRU 4/90

STA.	PARAMETER	QTR.	NO. SAMPLES	MIN VALUE	MAX VALUE	AVERAGE VALUE	STANDARD DEV.
VC-1	Flow	1	8	4.20	16.60	8.82	4.01
		2	26	2.40	55.90	15.64	12.55
		3	18	3.00	27.50	10.29	7.34
		4	13	2.70	21.40	6.73	4.60
	TDS	1	9	250.0	730.0	419.6	133.3
		2	28	156.0	458.0	301.1	74.2
		3	18	234.0	531.0	359.7	82.2
		4	17	280.0	550.0	371.8	83.4
	TSS	1	7	11.0	309.0	109.7	116.5
		2	26	12.8	3,680.0	220.0	699.1
		3	15	2.0	6,460.0	463.6	1603.1
		4	16	1.0	78.0	21.8	18.3
	pH	1	8	7.2	8.7	8.0	0.4
		2	28	6.8	8.9	7.7	0.5
		3	18	7.0	8.7	7.8	0.5
		4	17	6.7	8.2	7.7	0.4
	Fe (Tot)	1	9	0.20	7.66	1.92	2.45
		2	19	0.10	7.51	1.62	1.86
		3	13	0.07	7.25	1.29	1.99
		4	17	0.06	1.75	0.37	0.37
	Mn (Tot)	1	9	0.01	0.33	0.44	0.09
		2	20	0.03	2.11	0.19	0.44
		3	13	<0.01	2.00	0.19	0.52
		4	17	0.01	0.10	0.04	0.03

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OCT 2 6 2001

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VC-2	Flow	1	7	3.50	14.00	7.43	3.53
		2	26	2.30	45.01	15.31	10.34
		3	15	1.50	10.36	6.16	2.03
		4	13	2.00	11.60	6.24	2.78
	TDS	1	9	280.0	728.0	415.4	125.4
		2	28	160.0	447.0	295.1	79.9
		3	18	240.0	480.0	356.2	70.9
		4	17	295.0	510.0	375.8	78.6
	TSS	1	7	8.0	139.0	53.3	47.5
		2	26	2.2	2,820.0	201.4	538.1
		3	15	6.0	14,025.0	979.2	3487.2
		4	16	1.0	53.0	16.0	13.5
	pH	1	9	7.5	9.2	8.0	0.5
		2	28	7.0	8.9	7.8	0.5
		3	18	7.3	8.7	7.8	0.4
		4	17	7.1	8.7	7.7	0.4
	Fe (Tot)	1	9	0.13	4.31	1.08	1.27
		2	20	0.10	72.8	5.23	15.62
		3	13	0.13	3.44	1.09	1.22
		4	17	0.16	1.37	0.45	0.33
	Mn (Tot)	1	9	0.017	0.150	0.080	0.047
		2	20	0.003	1.360	0.153	0.286
		3	13	0.001	6.500	0.545	1.719
		4	17	0.010	0.100	0.044	0.028
VC-4	Flow	1	5	0	0	0	0
		2	20	0	1.00	0.18	0.29
		3	16	0	0.07	0.010.01-	0.02
		4	11	0	0.05	100.2	0.01
	TDS	1	0	-	-	209.0	-
		2	15	40.0	166.0	285.01-	35.9
		3	12	110.0	344.0	42.4	51.9
		4	4	145.0	600.0	1,477.8	147.4
	TSS	1	0	-	-	116.5	-
		2	15	13.0	89.0	-	24.3
		3	11	8.4	15,940.0	7.6	4573.4
		4	6	8.8	498.0	7.7	172.7
	pH	1	0	-	-	8.0	-
		2	14	6.9	8.7	0.6	0.5
		3	13	7.0	8.4	-	0.5
		4	6	7.2	8.7	0.95	0.6
	Fe (Tot)	1	0	-	-	1.10	-
		2	12	0.13	4.24	3.98	1.04
		3	7	0.05	4.42	-	1.42
		4	6	0.10	22.50	0.026	8.28
	Mn (Tot)	1	0	-	-	0.973	-
		2	12	0.001	0.090	0.105	0.022
		3	7	0.001	6.550		2.277
		4	6	0.001	0.560		0.204

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OCT 26 2001

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VC-5	Flow	1	5	0	0	0	0
		2	26	0	3.70	1.02	0.97
		3	18	0	1.20	0.35	0.35
		4	14	0	0.40	0.09	0.14
	TDS	1	1	359.0	359.0	359.0	-
		2	25	138.0	4,000.0	569.8	776.6
		3	17	210.0	523.0	380.5	96.7
		4	7	255.0	508.0	382.1	75.3
	TSS	1	1	3860.0	3,860.0	3860.0	-
		2	24	4.4	4,050.0	887.3	1376.7
		3	16	1.0	17,030.0	1134.7	4105.2
		4	7	17.0	611.0	140.6	203.6
	pH	1	1	7.6	7.6	7.6	-
		2	25	6.3	9.2	7.6	0.7
		3	17	7.0	8.7	7.9	0.5
		4	7	7.2	9.0	8.0	0.5
	Fe (Tot)	1	1	88.00	88.00	88.0	-
		2	16	0.04	88.50	10.51	24.30
		3	12	0.01	10.25	1.75	2.78
		4	7	0.22	4.25	1.24	1.46
	Mn (Tot)	1	1	1.65	1.65	1.65	-
		2	16	0.01	1.80	0.37	0.63
		3	12	<.01	7.15	0.64	1.96
		4	7	0.01	0.26	0.07	0.09
VC-10	Flow	1	3	0	0	0	0
		2	24	0	10.20	2.750.94	2.99
		3	21	0.03	8.50	0.29	1.76
		4	12	0	0.80	356.0	0.20
	TDS	1	1	356.0	356.0	234.3	-
		2	22	150.0	393.0	291.5	60.3
		3	21	139.0	721.0	295.3	118.7
		4	14	212.0	384.0	38.0	51.2
	TSS	1	1	38.0	38.0	26.8	-
		2	22	4.4	115.0	20.3	30.1
		3	19	4.0	89.0	14.1	25.9
		4	14	2.0	40.0	-	10.5
	pH	1	0	-	-	7.7	-
		2	22	6.9	9.2	7.8	0.7
		3	21	7.1	8.7	7.8	0.5
		4	14	7.3	8.6	0.22	0.4
	Fe (Tot)	1	1	0.22	0.22	0.43	-
		2	14	0.12	1.36	0.32	0.36
		3	15	0.01	1.33	0.27	0.32
		4	14	0.08	0.49	0.04	0.13
	Mn (Tot)	1	1	0.04	0.04	0.03	-
		2	14	0.01	0.08	0.03	0.02
		3	15	0.01	0.07	0.04	0.02
		4	14	<0.01	0.12		0.03

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

VC-11	Flow	1	1	0	0	0	-
		2	17	0.49	12.80	3.43	3.40
		3	13	0.23	2.55	0.96	0.69
		4	6	0.50	1.24	0.83-	0.24
	TDS	1	0	-	-	208.9	-
		2	17	114.0	385.0	296.5	69.8
		3	13	253.0	459.0	289.6	49.7
		4	7	252.0	331.0	-	24.5
	TSS	1	0	-	-	36.0	-
		2	17	7.0	201.0	26.1	46.6
		3	12	2.5	140.0	39.4	39.1
		4	7	1.6	123.0	-	40.7
	pH	1	0	-	-	7.5	-
		2	16	6.9	8.8	7.6	0.4
		3	12	6.9	8.4	7.6	0.4
		4	7	6.9	8.5	-	0.5
	Fe (Tot)	1	0	-	-	0.84	-
		2	10	0.18	2.16	0.53	0.69
		3	8	0.01	1.88	0.48	0.58
		4	7	0.03	1.60	-	0.53
	Mn (Tot)	1	0	-	-	0.04	-
		2	10	0.01	0.10	0.04	0.03
		3	8	0.01	0.09	0.03	0.03
		4	7	0.01	0.05		
VC-12	Flow	1	2	0	0	0	0
		2	18	0	4.20	1.13	1.44
		3	13	0	0.38	0.11	0.12
		4	7	0	0.20	0.07	0.07
	TDS	1	0	-	-	-	-
		2	17	105.0	322.0	193.9	60.6
		3	12	238.0	405.0	316.8	52.0
		4	5	260.0	397.0	318.8	44.6
	TSS	1	0	-	-	-	-
		2	17	3.0	228.0	36.4	54.1
		3	11	2.8	174.0	43.7	48.3
		4	5	1.0	104.0	24.6	39.9
	pH	1	0	-	-	-	-
		2	17	7.1	8.7	7.7	0.5
		3	10	7.1	8.2	7.6	0.4
		4	5	7.3	8.4	7.7	0.4
	Fe (Tot)	1	0	-	-	-	-
		2	10	0.02	2.90	0.67	0.79
		3	6	0.03	7.70	2.07	2.70
		4	5	0.11	8.20	1.77	3.22
	Mn (Tot)	1	0	-	-	-	-
		2	10	0.01	0.10	0.03	0.03
		3	7	0.02	0.09	0.04	0.02
		4	5	0.01	0.03	0.02	0.01

* Note data from this date to current date is available on the Division Database at http://hlunix.hl.state.ut.us/cgi-bin/appx-ogm.cgi.

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OCT 26 2001

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724.400. CLIMATOLOGICAL INFORMATION.

724.410. CLIMATOLOGICAL DATA REQUESTS BY THE DIVISION.

The continental climate of the Mine Permit Area is typical of high elevations in the Intermountain Region, with relatively high amounts of precipitation (occurring primarily as snow), low temperatures, and a short growing season.

724.411. AVERAGE SEASONAL PRECIPITATION.

According to Jeppson et al, (1968), the Mine Permit Area has a mean annual precipitation of approximately 30 inches. The national weather service recording precipitation gauge installed in Eccles Canyon recorded 29.8 inches of rain and snowfall during 1980. Most precipitation falling on the Mine Permit Area is received in the form of snowfall (approximately 77 percent) during the months of October through April. The remaining 23 percent occurs as rainfall during the months of May through September.

The following table shows annual precipitation for Utah as a whole, for a USGS station located at Nephi, Utah, for a Forest Service station located at the Coastal States Energy mine, and for a private station at Cyprus Plateau Mining Company (CPMC). This table can be used to help correlate spring flow increases or decreases with changing precipitation.

TABLE 724.411
ANNUAL PRECIPITATION (INCHES)

LOCATION	YEAR										
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
State	25.15	20.58	23.82	17.26	23.40	10.71	9.94	10.99	10.88	15.61	12.18
Nephi	23.57	24.16	19.11	16.83	20.65	12.30	12.79	13.06	12.69	-	-
Coastal States					26.99	26.98	19.68	20.43	17.24	22.41	
CPMC	-	-	-	14.42	21.07	13.82	18.07	13.51	8.97	9.65	10.7

See additional rainfall data in Appendix 7-1.

724.412. AVERAGE WIND CONDITIONS.

Local air patterns in the Central Utah Coal Basin area tend to follow the general surface drainage patterns controlled by topography. At night, the cooler denser air tends to flow down local drainages producing canyon breezes. Day time breezes tend to reverse this direction and flow up local drainages due to surface heating effects. Regional winds in the Mine Permit Area usually originate from the west and northwest and generally do not exceed 20 miles per hour (U.S. Geological Survey, 1979). Additional wind speed and direction information for the area may potentially be obtained from the mine permit application submitted by Coastal States Energy Company which is on file with UDOGM.

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OCT 26 2001
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724.413. SEASONAL TEMPERATURE VARIATIONS.

Temperatures in the area are highly influenced by elevation (Utah Division of Water Resources, 1975). According to Jeppson et al. (1978), January temperatures range from a mean minimum of about 7 degrees Fahrenheit to a mean maximum of 28 degrees Fahrenheit. July temperatures range from a mean minimum of 40 degrees to a mean maximum of 77 degrees Fahrenheit. The average frost-free season of the Mine Permit Area lasts about 40 days.

724.420. ADDITIONAL INFORMATION.

No additional data is necessary or has been requested to ensure compliance with the requirements of R645-301 and R645-302.

724.500. SUPPLEMENTAL INFORMATION.

According to information provided within this submittal, there are no adverse hydrologic impacts addressed under the PHC, nor are there acid-forming or toxic materials present that require supplemental information as required under this section.

724.600. SURVEY OF RENEWABLE RESOURCE LANDS.

Ground water aquifers and their recharge zones do exist on and adjacent to the Mine Permit Area. These ground water aquifer and recharge areas are discussed in Section 722 of this permit. Additional information related to subsidence can be obtained by referring to Appendix 724.600, Section 733.140, and information related to hydrologic consequences of mining can be found in Section 728.

724.700. ALLUVIAL VALLEY FLOOR REQUIREMENTS.

By an earlier determination between the mining facility and the State Regulatory Agency it was determined that neither of the applicants facilities were within an alluvial valley floor. The Belina Permit Area is located within the headwaters of a canyon drainage system, and the Valcam Loadout Facility (previously sometimes referred to as "Utah No. 2") is located upstream of a valley floor. According to a conversation between Hansen, Allen & Luce engineers and Rick Summers of UDOGM on May 11, 1989, it was learned that UDOGM has a letter from a State Soil Scientist that indicates that the Coastal States and Blazon mines are not located in an alluvial valley floor. This information was confirmed through a review of the original OSM "Recommendation for Approval" letter written by Mr. Allen D. Cline in 1984. In the 1984 letter Mr. Cline states:

> "The alluvial valley floor that was identified in the vicinity of the Belina mines (i.e., in Pleasant Valley below the Utah No. 2 loadout) is not within the proposed permit area and no farming will be interrupted, discontinued, or precluded. In addition no material damage to the water supplied to the alluvial valley floor will occur as a result of mining."

Information contained in the Technical Analysis also shows a similar finding. In Section X entitled "Alluvial Valley Floors - UMC 785.19 and 822" the following statements are made:

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OCT 2 6 2001

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> "The PAP indicates that the lower part of Pleasant Valley (i.e., below the proposed Belina permit area) has historically been flood irrigated and may also be subirrigated near the stream channel. OSM staff evaluated the AVF characteristics of Pleasant Valley during a field trip in early August 1983. The field investigation confirmed the statements in the PAP, that the upper part of Pleasant Valley (near the Utah No. 2 Mine) is narrow an is generally not suitable for flood irrigation development. The lower part of the valley was observed to be flood irrigated. In addition, it appeared that grasses on the valley bottom may be subirrigated...
>
> ...it is concluded that the surface topography, soils, water quality, and water quantity of lower Pleasant Valley (i.e., below the Utah No. 2 mine) are all suitable for flood irrigation agricultural activities. It is concluded, therefore, that lower Pleasant Valley is an AVF with the essential hydrologic functions of flood irrigation and possibly subirrigation. Conversely, it is concluded that the narrow valleys of Whisky Canyon, Eccles Canyon, and Pleasant Valley above the Utah No. 2 mine facilities are not AVF's.
>
> Additional information developed in the CHIA report shows that water quantity will not be impacted either at the Belina mines nor the Utah No. 2 facilities. This study also shows that water quality will be within the agriculture and livestock limits for protection of beneficial uses of water (Utah Division of Health, October 1978). These conditions will prevail not only for the proposed 5-year permit term but also for the life of the mine. Therefore, the proposed operation will not materially damage the water supplied to the Pleasant Valley AVF and the Belina mines will not interrupt, discontinue, or preclude farming on the AVF. Therefore the PAP is in compliance with respect to UMC 785.19 and 822."

According to the Blazon Mine report in the possession of UDOGM, the area below the Valcam Loadout Facility is a valley fill area, however, the Valcam loadout area and upstream areas are not. Reasons generally cited for determining that the requirements for an alluvial valley do not apply are 1) no sub irrigation system is being used in the area, 2) the Mine Permit Area itself is not being used for agricultural or flood irrigation, and 3) the topography is typical of a narrow canyon and not a broad valley. Copies of the "Recommendation for Approval" and applicable portions of the "Technical Analysis" letter are found in Appendix 724.700.

725. BASELINE CUMULATIVE IMPACT AREA INFORMATION.

725.100. HYDROGEOLOGIC INFORMATION FROM GOVERNMENT SOURCES.

No known data (other than water right and well log data) exists from Federal or State Agencies for the Mine Permit Area as requested by this regulation. All well logs available from the State Engineers Office for wells within the search area as shown on the surface and ground water right map (724.100a) are located within Appendix 725.100. Note that well logs are not on file at the State Engineers Office for some of the well water rights shown on the map.

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725.200. HYDROGEOLOGIC INFORMATION FROM APPLICANT.

This information is provided under Sections 600 and 728.

725.300. APPROVAL REQUIREMENTS.

All hydrologic and geologic information required for permit renewal is contained within this document.

726. MODELING.

Surface water modeling used within this MRP was restricted to the use of a computerized SCS runoff prediction model developed by Hansen, Allen & Luce, Inc, as well as some basic pond routing as required for design. Surface water modeling used in this revision for pond 004A and dugout D-1 was restricted to SEDCAD 4.0 as required for design. It is understood that all designs implemented as a result of the modeling techniques are reviewed and compared using similar in house techniques by the regulatory agency prior to installation. No ground water modeling has been completed for the applicant.

727. ALTERNATIVE WATER SOURCE INFORMATION.

The impacts resulting from local mining include those identified under Section 724.600 related to subsidence, and those general impacts identified under Section 728 related to the hydrologic impacts of mining. Alternate water sources for interrupted or affected water supplies are identified in the respective section if applicable.

728. PROBABLE HYDROLOGIC CONSEQUENCES (PHC) DETERMINATION.

In addition to the discussion on probable hydrologic consequences of mining provided within this section, the reader is referred to Section 600 wherein a discussion related to the geologic related impacts of mining is given.

728.100 thru 728.333. PHC DETERMINATION OF QUALITY AND QUANTITY.

HYDROLOGIC IMPACT OF MINING ACTIVITIES

As has been noted previously in this permit, the Mine Permit Area is covered almost entirely by the Blackhawk Formation. This formation consists of interbedded layers of sandstone and shale separated by various minable and non minable coal seams. The sandstone beds are generally massive while the shale layers act bentonitic, tending to swell when wet and decomposing into a semi-impervious clay. Investigations at springs and streams in the Mine Permit Area have indicated that the shale layers impede downward percolation of water through the Blackhawk. Danielson et al. (1981) observed that the downward movement of water is impeded by shale layers in the Blackhawk which carry the water to a discharge point where the shale layers outcrop. The fact that most springs are on fairly steep hillsides and not in channel bottoms where a regional aquifer would tend to discharge provides additional evidence that the springs in the upper elevations of the Blackhawk Formation (such as those within the Mine Permit Area) are draining perched aquifers. These springs tend to receive water from localized rather than regional sources.

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In determining the magnitude of the effects of mining on areal hydrology, it is important to recognize the uses of the hydrologic resources. Within the Mine Permit Area, the principal use of the hydrologic resources is for watering livestock and wildlife as shown in Table 724.100a. The area has numerous springs, seeps, and several streams. It is believed that the disturbance of some of these water sources will not necessarily create a hardship on livestock or wildlife because of the existence of numerous water sources. The overall impact to livestock and wildlife will however depend upon the magnitude of local disturbance due to mining activities.

As an aid in determining the hydrologic impacts of mining, spring depletion curves have been prepared for each of the monitored stations located within the Mine Permit Area. These spring depletion curves are prepared annually as stated within Section 731.222. Spring depletion curves for the years 1980 through 1989 are presented in Appendix 728 for Stations S7-11, S24-12, S25-13, S31-13, S36-17, S36-19, and S36-23. Data for new spring monitoring station S36-7 will be included as the data becomes available. A brief review of spring depletion curve data was made in preparation for this MRP wherein a matrix was formed to indicate by curve whether spring flow had increased or decreased for any particular year.

The matrix analysis indicates that all seven springs identified above showed a consistent decrease in flow over flows recorded during the previous year for the 1981, 1985, and 1987 time periods. Even data collected for 1984 and 1989 showed only minor exceptions to this pattern. A review of data collected during 1984 indicates that two of the seven springs showed little (if any) variation between the years 1983 and 1984. Only one station in 1984 (S36-23) showed an increase in flow, and even this increase was minor in comparison to recorded variations at other locations. A careful review of the spring depletion curves will reveal that the 1989 exception is in question as to the accuracy of the recorded flow rate. The data would seem to indicate that the recorded flow is higher than would be anticipated based upon locally recorded climatic conditions. Given these slight anomalies, it appears that five of the nine years of record show a consistent decline in flow rate over flows recorded during the previous year.

Increased flow patterns were found to exist at all stations for the years 1982 and 1986, as well as for 1983 with only one exception. The exception noted at the time of the 1983 sampling of station S31-13 is related to the fact that little if any change in flow condition is noted. All springs with the exception of S7-11 and S36-17 showed increased flow conditions during the 1988 sampling. Station S7-11 shows a fairly large decrease in flows between 1987 and 1988 whereas the decrease for station S36-17 was only minor.

Spring flows throughout the Mine Permit Area vary over the years with wet years recharging the ground water systems and dry years depleting them. Only within the last two or three years has there been noted a continued decrease in spring flows which has not been characteristic of historic conditions. These decreases in spring flows can be directly attributed to decreased precipitation and recharge as discussed within Section 722.100 and are not believed to be the result of mining impacts. Precipitation records which help document local and regional drought conditions were presented earlier in Table 724.400a. Continued monitoring of local area springs and the preparation of spring depletion curves will aid in determining if and when impacts are felt by the local hydrologic system.

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OCT 26 2001

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A discussion of water quality impacts of mining as required within this section is given within each of the following subsections as it relates directly to the effect of mining.

SUBSIDENCE EFFECTS

Effects related to subsidence are discussed within Appendix 724.600 with mapping showing subsidence related issues found on Maps 728.100a and 728.100b.

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OCT 26 2001

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MAP 728.100a. Subsidence Base Map
MAP 728.100b. Subsidence Survey Location Map

MINE DEWATERING EFFECTS

More water had been encountered inside the Belina No. 1 Mine than was initially anticipated. Significant sources of mine water have generally been associated with faults or rills in the formations. However, consistent with initial projections, some faults have been essentially dry. The identification of additional faults (beyond those originally known to exist) is believed to be one cause of the higher than anticipated amounts of water encountered. Above average precipitation and runoff in 1982 and particularly 1983, and the effects of more surface subsidence than was initially expected are also believed to be contributing to the increased amount of water in the mines.

Water is usually made at the face of the mine workings. Hansen (1979) reports that mines in the Wasatch Plateau coal field generally yield less than 10 gallons per minute per active face, with drifts drying approximately 500 feet up-dip from the face. Once a section dries up, leaks rarely reappear. This condition has been observed locally in the Belina Mines with the exception that dry conditions generally develop within 200 feet of the face. Apparently, only a zone of saturated sandstone immediately adjacent to the mine face is dewatered by the drift.

Water made within the mines (except for water intercepted by subsidence cracks) is not expected to have any relation with the perched, undisturbed aquifers. Mine water is either stored within the mines, evaporated, hauled out as moisture on the coal, or discharged into Whisky Creek. The exact quantity of water evaporated and pumped out of the mines via the fan is not known. Data are not available to make such a calculation. However, as reported in the technical review comments from OSM, 19 million gallons (equivalent to only 36 gpm) of water are evaporated annually within the Utah Power and Light Company Wilberg Mine. This estimate is based on an air flow in the Wilberg Mine of 570,000 cfm, with air entering the mine at 45 percent humidity and exiting at 98 percent humidity. Air entering the Belina No. 1 Mine is believed to have greater humidity than the Wilberg Mine due to differences in climatic factors between the two mine sites. There will therefore be less potential for moisture pickup through the Belina Mines than in the Wilberg Mine.

The air flow through both the Belina No. 1 and No. 2 Mines is approximately 565,000 cfm (405,000 cfm from Belina No. 1 Mine), approximately that of the Wilberg Mine air flow rate. Considering the humidity comparison made above, it is estimated that the water loss due to evaporation in the Belina No. 1 and No. 2 Mines will be less than 36 gpm. The amount of water hauled away as culinary wastewater is equivalent to an annual average flow of about 1.4 gpm. Approximately 16 pounds (0.26 gallons) of water leave the mines with each ton of coal shipped from the mines. At an eventual maximum production rate of 2,016,000 tons per year (only abut 750,000 tons were shipped in 1982), this amounts to an equivalent flow of 7.4 gpm.

Flow measurements have been made of the mine water discharge from the Belina No. 1 Mine since 1977 (there has been no discharge from the Belina No. 2 Mine). Discharges statistics for available data for the period between January 1981 and June 1989 are shown in Table 728.100a. Discharges at the Belina No. 1 Mine increased during 1983 over that recorded for the prior six-year period. The increases experienced are believed to be the result of 1) increased natural recharge to the ground water system resulting from variations in the local climatic cycle, 2) an expansion of mine workings thereby resulting in the interception of additional waters, and 3) the interception of water, or dewatering of small perched water systems as a result of local subsidence.

The peak mine discharge of approximately 422 gpm was recorded on August 12, 1983. Current 1988 and 1989 discharges are ranging between 22 and 346 gpm (.05 to .77 cfs). Because mine discharges were constant for a number of years, Whisky Creek was categorized by UDOGM as a perennial stream, however, since no flows have originated from the mine for some time, this classification is unwarranted. The hydrologically correct classification for Whisky Creek is as an ephemeral stream. During the three-year period between 1980 and 1982, the U.S. Geological Survey recorded and published flow records for Eccles Creek. At that time the Belina Mines discharge accounted for approximately 2.2 percent of the flow of Eccles Creek and about 0.7 percent of the flow of Mud Creek below Winter Quarters Canyon.

TABLE 728.100a.
DISCHARGE STATISTICS FROM THE BELINA NO. 1 MINE IN CFS (1981-1989)

STATISTIC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Count	7	5	6	9	8	7	6	5	8	7	7	4	79
Minimum	0	0	0	0	0	0	.02	.02	0	0	0	0	0
Maximum	.40	.07	.53	.77	.46	.93	.50	.32	.94	.31	.93	.15	.40
Average	.08	.03	.14	.11	.18	.39	.19	.11	.42	.12	.29	.06	.19
Std Deviation	.13	.03	.19	.23	.18	.36	.21	.11	.36	.13	.35	.06	.26

As pointed out by Waddell et al. (1983), mining activities may have the effect of redistributing the flow along a stream. For example, flow discharged from the Belina Mines would probably reach Mud Creek eventually if the mines did not exist, but would be added at different discharge points (such as seepage zones in Eccles or Mud Creeks). Intercepting water in the mines probably most likely has the effect of increasing the base flows in Whisky Creek, Eccles Creek, and Mud Creek during the mining period. When the mining operation ends, base flows may be reduced slightly until mine cavities are filled. However, as pointed out, the magnitude of the increase or decrease of baseflows has been, and is expected to be relatively small when compared to the flow of the principal receiving streams.

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A probable beneficial effect of mine dewatering that may partially or completely offset the slight negative effect on water quality previously described as a result of subsidence was noted by Vaughn Hansen Associates (1980). Because the Belina Mines act as interceptor drains, the ground water that is brought to the surface may under certain circumstances have a lower dissolved solids content than would have existed if the water were to continue its downward movement through shale layers, dissolving increased amounts of salt with distance (Southern Utah Association of Governments, 1977; Hansen, 1979). In this regard, local mines will have a slightly beneficial impact on the chemical quality of water in area streams by decreasing contact time with the shale layers of the Blackhawk Formation.

Suspended sediment and oil and grease increases in water being discharged from the mines are removed through a filter pond (005A) located at the discharge point of the Belina No. 1 Mine. Effluent is treated through the series of basins within the pond to maintain regulatory requirements prior to discharge into adjacent streams.

Because of the high alkalinity and low acidity concentrations in the area (differing normally by one of two orders of magnitude), acid drainage problems should not occur as a result of mining. This is fortified by the fact that coal in the area has a low sulphur content (U.S. Geological Survey, 1979).

There is the potential for mine dewatering to divert some water from the Huntington Creek Drainage into the Mud Creek Drainage through in-mine pumping used to maintain operations. However, the coal seam is down-dipped towards Huntington Creek to the west. As areas are mined and abandoned on the west side of the Mine Permit Area, they will collect water which was encountered in mine sections normally within in the Mud Creek drainage. It is difficult at this time to identify the flow paths of in-mine water due to the constant need for change within the mines to accommodate mining operations. Consequently, it is uncertain which surface water basin may receive additional water at the expense of the other. It is anticipated however that the potential trans-basin effect is small (less than 1 percent) and insignificant to either Huntington Creek or Mud Creek baseflows.

There has been some concern expressed regarding the fact that flows from a spring on the west side of Pleasant Valley Canyon near the Valcam Loadout Facility diminished several years ago. Investigation by the applicant related to this matter has shown that the decrease in flows occurred during the 1977 drought. For example, Gooseberry Creek, a nearby gaged stream, experienced only 19 percent of its 44-year average during the 1977 water year. Dry precipitation periods are expected to produce lower than normal spring flows in the periods that follow. The spring in question has been noted by mine personnel to now be flowing at a rate generally consistent with those flow rates noted prior to the decrease. The spring is located on the opposite side of Mud Creek from the Valcam Loadout Facility.

OPERATIONAL EFFECTS

Probable impacts of mining, both underground and surface, upon the surface water system include those associated with changes in water quality or quantity. Water quantity changes are discussed in other areas of this permit section. Water quality changes may be the result of increased or decreased flow conditions, streamflow alteration and flow diversion, increased sediment or salt loadings, and increases in selected chemical constituents such as oil and grease, or the potential for acid and/or toxic forming materials to contaminate surface and ground water supplies.

Increased or decreased flow conditions will occur as facilities and drainage control channels are installed in response to the needs and requirements of both the coal mining industry and regulatory requirements. Mining facilities including offices, bathhouses, storage sheds, maintenance buildings, etc. all of which require the modification of a sufficient portion of the adjacent land surface to house the mining operation. These land modifications result in changes to natural flow paths and runoff rates as flows are diverted either around the mining operation or through a series of ditches, culverts and sedimentation ponds. The installation of runoff facilities are for the express purpose of minimizing impacts as directed in the regulations. Surface waters originating upon or passing over the mining area are collected into man made ponds wherein flows are detained or retained thereby minimizing downstream erosional or flooding impacts.

The fact that flows are diverted out of their natural overland flow paths and concentrated into small diversion ditches creates a potential for increased erosion. Under most conditions however, the erosion potential within these small ditches is designed to be relatively small and may in fact be less than that experienced naturally. Unchecked rills and gullies formed naturally through flow concentration may in some cases produce locally larger amounts of eroded sediment than that produced through controlling runoff.

Mans presence in any area will result in the introduction of non naturally occurring materials into the environment. In the presently discussed mining situation these introduced materials generally consist of such items as oil & grease and road salt. Oil and grease generally originates from mining equipment necessary to remove the coal from the mine and prepare it for sale and transport. Road salt is applied at times directly to mine roads as part of winter safety prevention programs designed to protect the health of both miners and visitors to the mine. These parameters are collected via surface water conveyance ditches and culverts and stored in local sediment ponds. Every attempt is being made to eliminate and control these parameters such that the effects on downstream areas is minimized.

Acid and toxic forming materials often become a critical source of potential contaminant to both the surface and ground water supplies. According to Valley Camp personnel, no acid or toxic forming materials are present in coal being mined at the Belina mines. As part of this permit, the applicant agrees to take composite samples from shipped coal at the train loadout facility to confirm the lack of local acid or toxic materials. Should any be detected, a more comprehensive program will be initiated with the aid of the regulatory agency to identify the source of the material and to develop a plan to meet regulatory requirements. Analysis results for a composite sample of coal taken during the month of October, 1992, support the conclusion that no acid or toxic forming material are present in coal being mined at the Belina mines. The results of the analyses are shown in Appendix 623.100a.and Appendix 6-1.

Compacted surface conditions promote the collection and transfer of materials to downstream locations more readily than those naturally occurring. Oil and grease produced by mining equipment as well as road dirt and salt are transported quickly to surface diversions which in turn carry the material in concentrated channels to sedimentation ponds located at the downstream ends of disturbed areas. This concentration is different than that which may occur

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OCT 26 2001

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under natural conditions where wind blown dirt may become trapped within vegetative soil cover complexes, surface depressions, or cracking. Under natural conditions, little to no oil & grease and road salt would be present. In order to identify potential impacts to the surface system, the water quality program outlined within this permit is proposed for implementation. As part of this program, seasonal water quality statistics are collected and analyzed as discussed in the following paragraphs.

Seasonal surface water quality variations are discussed within Section 724.200 of this permit with Table 724.200a documenting seasonal water quality statistics associated with each surface water monitoring station. Data shown in the table can be used to help identify those seasonal impacts to water quality which are mine related. For example, Station VC-4 is located along Whisky Creek above the Belina Mine complex whereas Station VC-5 is located on Whisky Creek at its confluence with Eccles Canyon Creek. Seasonal water quality variations noted between the two stations helps identify impacts to surface waters resulting from mining activities. The following discussion gives a guide to some of the differences which are identified in the water quality statistics between Stations VC-4 and VC-5. Station VC-4 will be moved 280 feet upstream to the disturbed area boundary as a result of the surface mining operation that will affect the current location. This location will not monitor the flow from the side drainage which enters Whisky Creek at the location of the previous site. However, quality will not be affected, but comparison with earlier data should show lower quantities since this side drainage will not be included in the new site measurements.

The surface mining operation will disrupt the water flow through the area during the mining and reclamation of the site. The water flows will report to sedimentation ponds before reporting to Whisky Creek. The springs and seeps in the area of the surface mining area will also be disrupted for a period of time during the operation and reclamation. This water is anticipated to potentially surface at a lower elevation or the toe of the reclaimed slope before reporting to the Whisky creek stream flow.

As noted in Table 724.200a, flow at VC-4 rises only slightly during the spring and summer period whereas increased flows are more readily identified for VC-5. This is due to snowmelt between Stations VC-4 and VC-5, increased spring and seep flow, and periodic mine discharges to the surface into Whisky Creek. The presence of the underground mine effects local area hydrology in the sense that local stream flows are increased when mine waters are discharged through the filter pond to the stream channel. During low flow winter periods the Belina mine discharge may be the only water entering Whisky Creek since little if any flow has been noted historically at Station VC-4 within the upper portions of Whisky Creek above the mine. The surface mining operation does not anticipate substantial ground water flows, so mine discharge to the system will be reduced.

Naturally occurring seasonal TDS variations are believed to be similar to those identified for VC-1, VC-2, VC-4, VC-10, VC-11 and VC-12 where average quarterly values are recorded to be the lowest during the spring snowmelt period and highest during lower flow periods. TDS values are typically lower during high flow periods than at other periods of the year due to the dilution of the water quality parameter. Station VC-5 is the only surface water station which breaks this standard pattern, the potential reason for which is discussed below.

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OCT 26 2001

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The Mine Permit Area experiences heavy snowfall during winter periods resulting in the need for ice and snow removal in order to maintain safe road conditions. Snow removal equipment are used throughout active mine areas to remove the heavy accumulations of snow which fall each year. Many road areas also require the addition of salt to reduce and eliminate ice accumulations. These snow and ice removal practices, although necessary, contribute to the addition of additional salt loads to local streams. Local impacts resulting from the addition of road salt is limited to winter periods when ice accumulations prevail. Should additional data be available, it is believed that the data would show that increases in TDS (over background) within the heaviest snowfall period of the year are higher than those noted for other winter periods.

At VC-5 the highest average TDS period of the year has been recorded during the second quarter. The anomaly noted at VC-5 is not believed to be representative of true conditions at the site because the high value recorded basically results from two high TDS samples reported in the data. On June 27, 1986 and on April 22, 1988 TDS was measured to be 4,000 mg/l and 1,960 mg/l respectively. If these two samples are deleted from the database, then the average TDS value for the period of record drops from 591.64 to 352.80. By making this modification, the average TDS value then becomes the lowest quarterly average for the year consistent with other local stations. It is believed that the high TDS values reported at this station are likely the result of road salting operations required to provide safety to mine and transport employees.

The alteration and restoration of the upper portion of Whisky Creek as part of the surface mining process will not substantially reduce the surface water flow from the snow melt and spring and seep flows in the long term. However, it is anticipated that there will be minimal loss in the stream channel as nature completes the final sealing process of the stream channel bottom. The water quality should not suffer in the process due to the placement of sediment controls until vegetation is reestablished and the rock testing provide the confidence that metal leachates and acidity will not be a problem.

The ground water flows from the seasonal spring and two seeps along the highwall area will migrate to the surface through the toe of the reclaimed slopes. This flow generally occurs in the spring for a one to two month period and the quantities are less than 2 gallons per minute. The system is expected to return to normal with the location of the seeps occurring closer to the Whisky Creek channel.

IMPACTS UPON WATER RIGHTS

As discussed previously, ground water intercepted within the mines and periodically discharged in Whisky Creek will have the effect of redistributing flows within the hydrologic system, thereby potentially impacting both surface and ground water rights (which are discussed in Section 724.100) within and adjacent to the Mine Permit Area. The impact however is believed to be minimal. According to best information available, ground water within the Belina Permit Area has a general east west flow direction with the ground water divide located approximately alone the Carbon and Emery county lines. Waters entering the ground water system west of the ground water divide flow to the west towards Huntington Creek and Electric Lake. Those on the east flow toward Mud Creek, with the greatest majority of water feeding the area upstream and south of the confluence of Mud and Eccles Creeks.

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Water entering the mines from various sources may be conveyed to the surface and discharged into Whisky Creek, which in turn flows into Eccles Creek and Mud Creek. This discharged water is developed within the mines from various locations and includes water which would have naturally flowed through time into both Huntington and Mud Creeks. The amount of water diverted in this manner from Huntington Creek is not recovered downstream within the same drainage basin from which it was taken, but it is rather discharged into the Mud Creek drainage. Water rights which potentially use this water at downstream locations within the Huntington Creek drainage could potentially be impacted by this interbasin transfer of water. An accurate determination of what percentage of water may be affected by an interbasin transfer is difficult to obtain because of the high variability and occurrence of mine inflows.

In addition, east flowing ground water within the western half of the Mine Permit Area has the potential for entering Mud Creek at locations upstream of the confluence between Eccles and Mud Creeks. This potential exists through water table seepage along perennial streams, or from local springs. Although mine discharges will enter Mud Creek (and thereby remain in the same drainage basin), they will do so at the confluence with Eccles Creek and therefore not be available for use at upstream locations where water rights may potentially exist.

Information provided by way of ground water contours, geologic mapping and cross sections, and the mine plan however allow a reasonable approximation of general ground water movement within and adjacent to the mining operation. The general geologic dip of the local coal seams is to the south and west, however, the ground water divide based upon available contour mapping is located in relative orientation to the surface water divide. That is, ground water found within the eastern portions of the mine will generally flow to regions of lower potentiometric head found to the east toward Mud Creek. Ground water encountered within the western half of the mine will generally flow to the south and west toward Huntington Creek.

Following this hypothesis, water pumped to the surface from abandoned and sealed mine workings found within the First East Mains area would have generally found its way to Mud Creek, and therefore no interbasin transfer of water normally occurs as a result of pumping. Any historic water pumped from the Second and Third East Mains would have had a similar result since the overall ground water gradient is to the east. However, historical water pumpage created an average interbasin transfer of water amounting to approximately 45 to 50 gpm during the period of pumping. This estimate of pumpage impact is based upon historic cyclic pumping patterns remembered by Valley Camp personnel. According to information available, in-mine pumps would circulate for a five to ten minute period every 20 minutes, or 25% of the time. A review of pumping records (found within Section 731.221) shows an approximate average pumping rate of 190 gpm between 1985 and 1990, which if averaged over time produces the 45 to 50 gpm estimate. Since no in-mine pumping (including western mine areas) has occurred since 1990 there has been no potential for the interbasin transfer of water over the last three years, nor is any anticipated in the near future.

It is believed that Mud Creek on the east, and Huntington Creek on the west serve as boundaries to impacts which may potentially be created by discharging water from the mines. The potential impacts to surface and ground water rights resulting from mine discharges should therefore be confined within these boundaries.

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OCT 26 2001

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Impacts to water rights associated with the perched aquifer system could occur as a result of subsidence due to fracturing and cracking as discussed within the subsidence control plan presented within Appendix 724.600. Because the subsidence control plan contains issues different from impacts of subsidence upon water rights, water right concerns are discussed herein rather than in the appendix. In areas where overburden is about 700 feet or less, subsidence cracking can extend to the surface thereby altering the recharge/runoff characteristics of the area. Alterations can include partial or complete draining of perched aquifer systems if cracking is intercepted. Although it is impossible to predict the exact effects of subsidence on existing rights, an examination of the location of rights relative to potential subsidence impact areas help identify which rights may be impacted. From subsidence, spring and water right identification mapping included within this permit, it is found that the majority of rights which could potentially be effected by subsidence are those ground water rights associated with high perched systems, or stream flows which derive their base flow from high perched systems. A relatively few number of rights exist in these upper areas.

Impacts to surface water rights from subsidence could result from two areas. The first is related to the runoff-recharge characteristics of the area which are potentially altered where subsidence cracking extends to the surface. The small amount of surface runoff traversing a hillside could become trapped in a subsidence feature and enter the ground water system before reaching the natural stream course. Water thus trapped would however return to the surface at some other downstream location which may or may not (depending upon the location of the water right in question) impact local rights (either positively or negatively). The second impact would be through the interruption of a ground water source in its return path to the surface. Ground water movement and natural flow paths may potentially be interrupted by the presence of a newly formed subsidence failure or crack. The path provided by this new subsidence feature may redirect ground water flows to lower levels within the system before returning them to the surface, whereas the water may have returned to the surface at a higher elevation if the subsidence feature had not been encountered. The overall effects upon surface water rights due to subsidence however are believed to be small due to the relatively low flow rate characteristics of the local geology.

Of the groundwater rights (shown on Map 724.100a, Plate 7-1 (Section 10) within the Belina Mine Area potentially affected by subsidence, three rights (91-3595, 91-3596 and 91-1058) are associated with wells, and 5 rights (93-1532, 93-1533, 91-1643, 91-3499, and 91-3500) are associated with springs. All three wells are owned by the applicant and all but the well associated with water right number 91-1058 have been abandoned. The three springs mentioned are all located in the southwest corner of Section 31 as shown on the water rights map. This zone has less than 300 feet of overburden, and therefore could potentially be affected by subsidence. Water right number 91-3500 (Spring S31-13) is included in the water monitoring program to represent the three identified springs and will be monitored as a base for impacts due to subsidence.

Drawdown in the regional water table resulting from mine discharges may result in the diminution of flows in water table springs and perennial streams receiving seepage from the regional water table. However, the impacts associated with mine dewatering upon any given stream is anticipated to be small. Should they be required, water rights 91-3587 and 91-3588 in Boardinghouse and Finn canyons, and spring right 91-3586 in Lower Boardinghouse Canyon

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OCT 26 2001

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(owned by the applicant) could be used for mitigation to impacts. The monitoring program initiated by the applicant will help to identify both the short and long term effects of mining on water rights. Thus far, no impacts related to mining are distinguishable through the use of time plots of flow data.

Local wells, particularly those associated with water rights 91-1114 and 91-1560 (located in Eccles Canyon and owned by Coastal States), could potentially be affected to a small degree by mine dewatering. The overall impact to these wells however is anticipated to be small and should not impact significantly the ability of the well owner to continue to pump water from the well.

RECLAMATION EFFECTS

The effects upon the surface water system due to reclamation activities is anticipated to be generally confined to increased sediment loadings during heavy construction periods. As required, all surface water sedimentation ponds will remain in place until final reclamation in order to collect and retain disturbed area water. As a result, the majority of heavily sediment laden runoff will be contained within the respective sediment pond. It is recognized however that increased sediment loadings do occur with construction activities, and therefore increases in sediment loadings may occur until the area is regraded and vegetative growth is re-established. Specifics related to reclamation timing and activities are found within the separate Reclamation Plan section.

FLOODING AND STREAMFLOW ALTERATION

The surface mining operation will involve the alteration of the upper Whisky Creek. A stream alteration permit has bee approved by the Division of Water Rights and is attached in Appendix R2. Additional cross-sections have been provided on 100 foot center at a scale of 1"=50'. The stream section to be altered has been surveyed and cross-sectioned to collect data on the natural aspects of the current stream. The stream was divided into sections of common slope and environment. Data such as channel width and depth, number of drop structures and magnitude of drop height, the frequency and amplitude of meanders, material composition of drop structures, and gravel size fraction in each section of the stream. The restored stream will be constructed using the data that corresponds with the streams new slope configuration. The steeper sections will be constructed from the data collected from the present steep sections and so on. The details of the stream survey are included in Appendix R2. The natural material that makes up the current stream channel will be collected and stored separately from the other topsoil materials so it can be reapplied to the stream channel during restoration.

ALTERNATIVE WATER SUPPLIES AND HYDROLOGIC MITIGATING FACTORS

Although, impacts from the mines are not anticipated to significantly diminish the flows associated with any particular water right, the monitoring plan has been formulated to observe and aid in predicting such effects. In the event that an impact is determined, one of the following alternative means of water supply would be used by the applicant to replace an interrupted supply of any legal owner of such rights.

1. Private contractors living within the district could be retained to haul water to specific locations from applicant owned sources within Pleasant Valley.

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

2. The affected water right could be purchased by the applicant.

3. The applicant has two wells within the Mine Permit Area which could be utilized to supply supplemental amounts of water for both private or industrial use.

4. The applicant could initiate an exchange of water right with the State Engineer to exchange water owned by the applicant in Scofield Reservoir for water currently found at any one of the other 71 springs found within or adjacent to the Mine Permit Area for which water rights have not been filed. This option would in most cases be acceptable to the State Engineer if it could be shown that the spring upon which water is being filed is not critical to downstream rights between the spring and Scofield Reservoir.

As indicated above, the applicant owns several water rights on or in the vicinity of the Mine Permit Area, some of them being the more significant water rights in the area. A list of local water rights is shown in the Vaughn Hansen Associates (1980) report. Water rights listed in the report as being owned by the North American Coal & Coke Company are now owned by the applicant. The larger rights include: Clear Creek Springs (0.5 cfs), Clear Creek Mine Tunnel No. 3 (0.446 cfs), O'Connor Mine (0.047 cfs and 0.030 cfs), the Belina Mines Well (7.7 acre-feet per year), and stockwater rights on Boardinghouse and Finn Creeks (unspecified amounts). Although the applicant owns the water right on Clear Creek Tunnel No. 3, there is no longer a discharge associated with the tunnel, and therefore would not by useful for water right mitigation. Should the flow reappear, it would be available for mitigation of impacted water rights. The applicant has also transferred 15 acre-feet per year of water rights to the town of Scofield.

It is fully expected that if mining activities within the Mine Permit Area result in noticeable diminution of base flows in streams or springs, that the diminution would be less than the rights owned by the applicant. These supplies can be used to provide compensation to potentially damaged users. Meanwhile, downstream users are benefitting from the portion of these rights not currently utilized by the applicant.

In addition, the abandonment of certain sections of the mines will allow inflowing water to create a storage reservoir thereby again contributing to ground water flow. When mining in a particular section of the mines has been completed, that section of the mine is sealed off and allowed to fill with water to a level determined safe by MSHA. In areas where only pillar splitting occurs, this level could be as much as 10 feet. By allowing the water to be pumped to or stored in abandoned mine areas in this manner, the ground water system is stabilized, and surface discharges are eliminated.

729. CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT (CHIA).

729.100. DIVISION ASSESSMENT.

To be completed by UDOGM.

729.200. DIVISION REVIEW.

INCORPORATED

To be completed by UDOGM.

OCT 26 2001

DIV OF OIL GAS & MINING

730. OPERATION PLAN.

731. GENERAL REQUIREMENTS.

General requirements given under this section are discussed specifically in Sections 731.110 through 765 as appropriate.

731.100. HYDROLOGIC-BALANCE PROTECTION.

731.110. GROUND WATER PROTECTION.

731.111. GROUND WATER QUALITY.

Ground water quality within the Mine Permit Area is protected through the control of surface waters and containment facilities. Surface runoff facilities have been designed to control and convey all disturbed area waters (with the exception of those areas which are designated as ASCA's) into sedimentation ponds located at both the Belina and Valcam facilities. These facilities are discussed more fully in Section 740.

Acidic and toxic forming materials are not present within the Mine Permit Area and therefore do not impact the local ground water system. Mine shop areas using special chemicals or fluids in association with mine equipment contain and dispose of waste products in accordance with State law. Attempts are made to minimize areas used for the storage of mining equipment such that potential contamination zones are controlled. All facilities utilized for the storage and control of these special chemical or fluids are identified on the operations maps found within Section 500. The current spill prevention control plan prepared by the applicant has been included herein within Appendix 731.111.

Waste rock and materials developed within a mine either remain within the mine or are returned to the mine and are not disposed of on the surface, thereby eliminating and controlling the need for surface waste disposal facilities. This method of disposal maintains a natural environment for developed wastes.

731.112. SURFACE COAL MINING AND RECLAMATION ACTIVITIES.

Surface coal mining is being proposed in this revision within the existing surface disturbance area presently under permit at the Belina No. 1 and No. 2 mine areas within the Valley Camp permit area.

731.120. SURFACE WATER PROTECTION.

INCORPORATED

OCT 2 6 2001

DIV OF OIL GAS & MINING

731.121. SURFACE WATER QUALITY.

HANDLING OF EARTH MATERIALS

The Belina No. 1 and No. 2 Mines are relatively small mines located within the headwaters of a small drainage basin known as Whisky Canyon in which no acidic or toxic forming materials are known to exist. Surface facilities at the Belina Permit Area include miscellaneous buildings, a coal stock pile, and truck loadout facility, and sedimentation ponds.

Some slopes have been modified through the mining process (such as slope cuts for the installation of the coal pile and loadout facility). Some of these disturbed slopes lie within the runoff containment areas feeding the sediment pond thereby controlling runoff contamination through potential increased sediment loadings. Disturbed slopes lying without the runoff control area have been reshaped and revegetated according to reclamation requirements. Whether within or without the sediment control area, all non vertical cut slopes have been regraded and revegetated. The revegetation of these slopes will help to control to the degree possible sediment load increases. The surface mining at the White Oak Complex will increase the amount of disturbed area at the site. All water flow through the disturbed area is directed to the sedimentation structures and the use of siltation fences, traps and temporary vegetation will control excessive sediment loading downstream of the site.

Facilities located at the Valcam Loadout Facility include miscellaneous buildings, a coal truck dump, a coal stockpile, and a train loadout structure. As with the Belina Permit Area, the Valcam loadout area has some slope cuts which were required for placement of the loadout facilities since they are located within a relatively narrow canyon. All surface drainage within this Mine Permit Area (except for areas identified as ASCA's) is controlled through the use of three sedimentation ponds which will be discussed in Section 740. No known acidic or toxic materials are known to exist within the Mine Permit Area which would create any potential related water quality deterioration controlled under this regulation.

GROUND WATER DISCHARGES

The only mine related ground water discharge existing within the Mine Permit Area is the UPDES discharge from the Belina Mines (Filter Pond 005A). Discharge from Filter Pond 005A enters Whisky Creek at the upper end of the mining facilities. No known acidic or toxic forming materials are known to exist with which the mine discharge could intermix and thereby deteriorate surface water quality. Water quality related to the mine discharge is discussed more fully in Section 731.200.

RUNOFF FACILITIES

All surface runoff facilities have been designed to either collect and deliver disturbed area runoff to one of the five sediment ponds located within the facility, or to divert undisturbed water away from disturbed areas thereby protecting its pristine quality. Complete details related to the mine runoff and conveyance facilities are discussed in Section 742.

731.122. SURFACE WATER QUANTITY.

All undisturbed area surface waters are diverted around the Valcam Loadout Permit Area through undisturbed area bypass ditches and/or culverts thereby protecting the integrity of natural flow volumes and rates. Only the relatively small amount of rainfall falling directly upon the disturbed areas of the mines are temporarily diverted from their natural watercourse. The surface mining area is designed to have undisturbed area surface water and all disturbed area surface water at the White Oak Complex to report to ditches directed into sedimentation ponds wherein water quality is improved. The amount of disturbed area runoff (originating as precipitation) will increase from 29.5 to 46.8 acres, and collected in ponds sized for this amount of disturbance. Upon the completion of mining activity, the disturbed areas will be reclaimed and natural runoff will be restored.

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

731.200. WATER MONITORING.

This section includes a description of the surface and ground water monitoring programs which will be implemented within the Valley Camp Mine Permit Area during this permit renewal term. The program outlined herein is a continued modification of previous monitoring programs developed between Valley Camp personnel and the regulatory agency. A complete review of water quality parameters including a careful review of the "Guidelines for Establishment of Surface and Ground Water Monitoring Programs for Coal Mining and Reclamation Operations" has been made in response to this MRP. In response to this review, further clarification has been made relative to the overall timing of samples as well as reconsideration of water quality parameters to be included within the monitoring program.

Surface and ground water quality monitoring stations and identified water quality parameters will aid in determining local impacts due to mining. Changes which may potentially occur to the ground water system which will be identified through the monitoring plan found herein include the loss of water due to subsidence or mine dewatering, and the potential water quality deterioration due to increase sediments, oil & grease, decreased pH, or the increase of other water quality parameter concentrations. The monitoring and analysis programs outlined throughout the following sections will help identify impacts to the water systems through graphical and analytical methods and aid in identifying potential solutions where required.

The reporting format for monitoring data will be based upon results provided by an independent certified laboratory. The data records will contain as a minimum information relating to the date and time of collection, analysis conducted, and when appropriate, the related detection limits of all constituents tested for. The independent testing laboratory will provide documentation, upon request, as to the methods utilized for quality testing, and the associated detection limits.

731.210. GROUND WATER MONITORING.

731.211. GROUND WATER MONITORING PLAN.

The ground water monitoring plan used and implemented by the applicant includes 1) an update to information related to identified seeps and springs as determined from a seep and spring survey completed in August, 1990, and 2) the regular sampling of selected water quality parameters for predetermined sampling sites as determined from the five year seep and spring inventory update. The seep and spring survey completed in August of 1990 was conducted in such a way that all previously identified seeps and springs will be revisited, and sampling parameters monitored. Any new sites located during the field investigation will likewise be documented. All seeps and springs thus identified will be monitored for field parameters including flow, conductivity, pH, and temperature. In addition to these parameters, anion and cation analyses will be completed for those seeps and springs for which similar data was collected during the original 1980 survey. By collecting similar data to that available historically, a comparison can be made as to the overall relative changes which have occurred over time.

Ongoing seep and spring sampling for selected sites is accomplished according to the sampling schedule shown in Table 731.211a. The locations of the sampling sites are shown on Ground and Surface Water Sampling Locations with Seasonal Water Quality Map 722.100, and information related to quality of the waters is discussed in Section 722.

INCORPORATED
OCT 2 6 2001
DIV OF OIL GAS & MINING

The ground water monitoring program as required within the regulations includes where applicable the monitoring of springs, wells, and selected in-mine waters within the permit area. The water quality monitoring program as instituted for the Valley Camp Mine Permit Area presently includes consistent and scheduled monitoring of springs, and (when applicable) in-mine seeps and springs. No wells are currently monitored in the Mine Permit Area. In-mine sampling is discussed in more detail in the following pages. Springs monitored as part of this program consist of stations S7-11, S24-12, S25-13, S31-13, S36-7 (starting in 1992), S36-17, S36-19, and S36-23. These stations have been chosen because of their strategic location relative to mine workings, and their potential ability to indicate changes in ground water conditions.

As agreed to in previous permit applications, a review of projected mine workings over the next five years has been completed to identify the need for additional water quality monitoring stations. The need for additional water monitoring stations is evaluated based upon the potential for impact to an area by mining activities. In the event that projected mine workings extend into areas not currently monitored, new sampling sites will be considered for addition to the water quality monitoring plan.

Mining activities projected over the next five years will be concentrated within the Belina No. 2 Mine in the general areas shown in Map 722.100a. The area of impact of these projected mine workings falls well within the existing area of impact, therefore no additional water quality monitoring stations (beyond those already being sampled) are planned for this MRP. Monitoring stations may change from time to time based upon a mutual concurrence of UDOGM and Valley Camp.

As shown in Table 731.211a a comprehensive set of water quality parameters (identified as Baseline Parameters) is measured twice during the year prior to permit renewal. The baseline parameters required for permit renewal were collected during the low flow period in the fall of 1990 and the high flow period in the spring of 1991. The timing of the baseline samples is scheduled to coincide with high and low flow events. As shown in the table, the high and low flow events generally occur during the months of April or May and September or October respectively. The list of baseline parameters was developed from UDOGM guidelines as outlined in "Guidelines for Establishment of Surface and Ground Water Monitoring Programs for Coal Mining and Reclamation Operations". An overview of the water quality monitoring program developed by Valley Camp follows. Since this is a repermit application, only the operational and postmining phases of the monitoring program are presented. Other aspects of the guidelines including the location of surface and ground water resources etc., have already either been approved in prior submittals or are presented throughout the appropriate sections of this MRP.

Water quality data collected through the ground water monitoring program outlined herein will be used to identify impacts resulting by mining through graphical and statistical analyses completed on a yearly basis. Selected data will be plotted on time graphs over a moving five year period of record to identify the occurrence of trends in the data. If an undesirable trend is believed to be occurring, further evaluations will be conducted including statistical trend analyses. Should the analyses completed indicate that trends do exist, a more in-depth study will be conducted to identify the source of the trend, and solutions will be investigated which may potentially decrease or reverse the trend. Water quality parameters which are anticipated for use in these ground water trend analyses include Flow, pH, Iron, TDS and the Anions-Cations. The

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

use of spring depletion curves to determine impact are also proposed as discussed in Section 731.222.

SPRING MONITORING

All spring locations applicable to this permit which are sampled, or are proposed to be sampled have been identified and shown on Map 722.100a. The springs shown are believed to be representative of water quality for the area and are chosen so as to include currently mined areas as well as mined areas projected for the next 5 year period. Monitoring and sampling of these springs is scheduled to be completed as shown in Table 731.211a as per the recommended guidelines.

IN-MINE WATERS

The in-mine ground water monitoring program consists of 1) monitoring ground water inflow to the Belina Mines from individual mine inflow sources which exceed five gallons per minute for discharge periods in excess of 30 consecutive days, and 2) determining the consumption of ground water through evaporation, production, and mine discharge. According to Valley Camp personnel, no mine inflow sources exceeding the 5 gpm or 30 day criteria have been encountered within the past, and therefore no in-mine water quality data is available.

When new sources or areas of measurable flow are encountered (measurable flow meaning 5 gpm or more for a period in excess of 30 days), a sampling program will be initiated on a quarterly sampling schedule as recommended in the UDOGM guidelines. The sampling program will consist of the ground water parameters and monitoring frequency shown in Table 731.211a. Data submittals of sampling completed will be prepared for the regulatory agency on a quarterly basis, including a copy of a map indicating the location of new flow sources. Quarterly sampling will continue until in-mine flows diminish to less than 5 gallons per minute, or until the regulatory authority approves discontinuance of the sampling site.

When in-mine monitoring is found to be required, an annual in-mine ground water monitoring report will be submitted to the regulatory authority within 90 days after the end of the reporting year. Included within the report will be an estimate of the ground water balance including mine inflows, outflows, ventilation, evaporation, coal production, and mine discharge.

In addition to the in-mine water quality sampling program, a water quality sample will be taken (when required by the State Health Department) of mine bypass waters which originate from the face area of the Belina mines and discharge into Whisky Creek. These waters will be sampled (when required) according to the regular ground water quality monitoring program outlined in Table 731.211a.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

TABLE 731.211a
WATER QUALITY ANALYTICAL SCHEDULE

Revised: 9/90

	PARAMETER	MONTH OF SAMPLE					TYPE OF SAMPLE	
		APRIL	MAY	JUNE	JULY	SEPT OR OCT	SURFACE WATER	GROUND WATER
		(High Flow)				(Low Flow)		
FIELD MEASUREMENTS								
	Air Temperature	X	X	X	X	X	X	X
	Dissolved Oxygen	X	X	X	X	X	X	
	Water Level or Flow	X	X	X	X	X	X	X
	pH	X	X	X	X	X	X	X
	Specific Conductivity @ 25 ^{o}C	X	X	X	X	X	X	X
	Water Temperature	X	X	X	X	X	X	X
LABORATORY ANALYSES								
	Acidity	Once at High Flow *				X	X	
+	Aluminum, Total	Once at High Flow *				X	X	X
+	Arsenic, Total	Once at High Flow *				X	X	X
+	Barium, Total	Once at High Flow *				X	X	X
	Bicarbonate	X	X	X	X	X	X	X
+	Boron, Total	Once at High Flow *				X	X	X
+	Cadmium, Total	Once at High Flow *				X	X	X
	Calcium, Total	X	X	X	X	X	X	X
	Carbonate	X	X	X	X	X	X	X
	Chloride, Dissolved	X	X	X	X	X	X	X
+	Chromium	Once at High Flow *				X	X	X
+	Copper, Total	Once at High Flow *				X	X	X
+	Fluoride, Dissolved	Once at High Flow *				X	X	X
	Iron, Total	Once at High Flow *					X	
	Iron, Dissolved	Once at High Flow *				X	X	X
+	Lead, Total	Once at High Flow *				X	X	X
	Magnesium, Total	X	X	X	X	X	X	X
	Manganese, Total	Once at High Flow *				X	X	X
+	Mercury, Total	Once at High Flow *				X	X	X
+	Molybdenum, Total	Once at High Flow *				X	X	X
+	Nickel, Total	Once at High Flow *				X	X	X
+	Nitrate	Once at High Flow *				X	X	X
+	Nitrite	Once at High Flow *				X	X	X
+	Nitrogen: Ammonia	Once at High Flow *				X	X	X
	Oil & Grease	Once at High Flow **					X	
+	Phosphate, Total	Once at High Flow *				X	X	X
	Potassium, Total	X	X	X	X	X	X	X
+	Selenium, Total	Once at High Flow *				X	X	X
	Sodium, Total	X	X	X	X	X	X	X
	Sulfate	X	X	X	X	X	X	X
+	Sulfide	Once at High Flow *				X	X	X
	Total Dissolved Solids	X	X	X	X	X	X	X
	Total Hardness	Once at High Flow *				X	X	X
	Total Settleable Solids	X	X	X	X	X	X	
	Total Suspended Solids	X	X	X	X	X	X	
+	Zinc, Total	Once at High Flow *				X	X	X
LABORATORY REPORTING								
	Cation-Anion Balance	X	X	X	X	X	X	X

+ Baseline parameter, to be included in monitoring program (for Total and Dissolved) during high and low flow events during year preceding Permit Renewal.

* As allowed by site accessibility.

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

MINE DISCHARGE

Underground mine water discharges from Filter Pond 005A are monitored according to the current UPDES permit. Grab samples taken monthly are analyzed for pH, TDS, Iron, and Oil and Grease. Flow and TSS samples are taken bi-monthly. All discharge samples are collected at the Parshall Flume installed at the pond outlet prior to mixing of the mine discharge water with Whisky Creek. Underground mine water will not be discharged once underground operations at the White Oak Complex cease. Additional information related to the UPDES discharge permit for the mine discharge is given in Section 731.221.

731.212. GROUND WATER MONITORING SUBMITTALS.

Ground water quality and quantity data is submitted quarterly to UDOGM as required under this regulation. Data showing noncompliance of the permit conditions will continue to be brought immediately to the attention of UDOGM, with follow up action as required under 145 and 731 being taken. Annual reports will be submitted which will analyze any variance in flow and water quality characteristics.

When collected, a copy of all in-mine water quality data analyses will be submitted to the appropriate agencies prior to the 28th of the month following the sample. All historic data and sample results are on file at the offices of the Utah Division of Oil, Gas and Mining.

731.213. SIGNIFICANT AQUIFER DETERMINATION.

It has previously been determined that the materials lying beneath the Mine Permit Area generally consist of one of two types of geologic formations. The upper formation is identified as the Blackhawk Formation which consists of three types of shale, all continental in origin. It is within this formation that the three major coal seams are identified. The lower formation consists of the Star Point Sandstone. Both formations are generally tight, and therefore are generally incapable of yielding large amounts of water. The exception to this statement might be in the case where movement occurs through tension cracking. In the 1983 hydrology report prepared by Vaughn Hansen Associates, it is stated that "testing has shown the Star Point Sandstone to be extremely tight, yielding water in quantities of less than 5 to 10 gpm". Similarly, in a report prepared by Cordova, 1964, it is noted that the Blackhawk sands are 1) generally discontinuous in nature, 2) have low specific yields, and 3) are only locally important.

The regional importance of the Blackhawk sands as an aquifer is again minimized when it is understood that downward moving water is often impeded by discontinuous shale barriers within the formation. The presence of the shale tends to redirect any ground water movement to the surface or other drain system (such as a sandstone finger).

In summary, the overall water carrying capability of the geologic stratum within, and adjacent to the Mine Permit Area is low, and therefore, the geologic stratum does not play a significant part in regional water movement. It could also be said that in general terms, a ground water aquifer of major importance does not exist within the Mine Permit Area or adjacent area. Because of the relatively tight nature of local geology, the potential for contamination of the regional aquifer is limited. The ground water monitoring plan presented within this MRP outlines the location of sampling sites and parameters to be monitored to enable the identification of local and regional changes to water quality. For specifics related to these issues, the reader is referred to the appropriate sections within this permit.

731.214 thru 731.214.2. MONITORING THROUGH BOND RELEASE.

Annual monitoring of low flow water quality parameters for each ground water sampling location will continue between the cessation of mining until termination of bonding unless modified through subsequent permit renewals or through action by the regulatory agency. The data to be collected includes all regularly collected water quality parameters shown in Table 731.211a.

731.215. INSTALLATION/REMOVAL OF MONITORING EQUIPMENT.

All monitoring equipment which is potentially used for the purpose of measuring water quality and or quantity of ground water will be properly installed, maintained, operated during the mining process, and will be removed when no longer needed.

731.220. SURFACE WATER MONITORING.

731.221. SURFACE WATER MONITORING PLAN.

The surface water monitoring plan used and implemented by the applicant includes the parameters and sampling schedule shown in Table 731.211a. The locations of the sampling sites are shown on Map 722.100a, and information related to quality of the waters is discussed in Section 722. Sampling locations for the UPDES permit discharge points are shown on the sediment control facilities Maps 731.720a and 731.720d. Specifics related to UPDES discharges are given later in this section.

As agreed to in previous permit applications, a review of projected mine workings over the next five years has been completed to identify the need for additional water quality monitoring stations. The need for additional water monitoring stations is evaluated based upon the potential for impact to an area by mining activities. In the event that projected mine workings extend into areas not currently monitored, new sampling sites will be considered for addition to the water quality monitoring plan.

The current surface water monitoring program includes sampling locations from adjacent streams. Surface water monitoring stations include VC-1, VC-2, VC-4, VC-5, VC-10, VC-11, and VC-12. No lakes, reservoirs or impoundments are located on or immediately adjacent to the Mine Permit Area, and are therefore not included in the water quality sampling program for the mine. Station VC-4 was identified for inclusion in the monitoring program because of its location above the Belina Mines. This station will be moved up the Whisky Creek drainage to the disturbed area boundary because the surface mining operation will impact the prior site. VC-5 monitors water quality at the mouth of Whisky Canyon, thereby allowing for a direct comparison between water above and below the mine and its impact area. Station VC-10, located in Eccles Canyon provides a basis for comparison between impacted Whisky Canyon waters and other mine impacted waters from adjacent mining operations. Stations VC-11 and

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

VC-12 have been identified for inclusion within the monitoring program because of their ability to isolate drainage basin waters adjacent to the mining operation. Should ground water be impacted through mining efforts, a change in water quality in these stations might provide an indicator as to the overall relative magnitude and timing of the impact. Station VC-2 located along Mud Creek immediately above the Valcam Loadout Facility, and VC-1 located immediately below the facility will provide an indicator as to the relative impact of the Loadout Facilities on Mud Creek.

As a general guide to determine mining impacts, parameters including TDS, pH, iron and manganese will be compared with historic data for 1) the specific sampling station and 2) with background stations located above the mine. These comparisons will provide a check of noted variations between background and station specific historic water quality. The comparisons will also provide a clue to understanding the source of the changed water quality parameter as well as providing clues as to potential remedial actions to prevent additional increases.

Water quality data for selected parameters were presented in tabular form in Section 724.200. The data shown documents the minimum, maximum, average, and standard deviation of sample results for each surface water quality station. From the data shown in the table it can be seen that TDS values generally vary from the low 100's to the 300 to mid 500 range. A few samples are reported at higher values, however they are sporadic in nature and do not show normal operating conditions or water quality. Since the primary drinking water standard for TDS is 2,000 mg/l with 1,000 mg/l being the generally accepted limit (unless other water sources are not available), the water appears to be well within limits required for current and future water uses for this parameter.

The recommended limits for pH as given by the secondary drinking water standards are 6.5 to 8.5 standard units. Standards under the UPDES permit issued to Valley Camp range from 6.5 to 9.0. From the data it can be seen that average values for pH are generally found within the high seven to low eight range. Some maximum and minimum reported values have exceeded these limits, however it is felt that the number of such occurrences is small and not typical of normal operating conditions.

Iron has been reported at surface stream locations (not UPDES discharge locations) to be generally found within the range of between 0.01 and 8 mg/l. Some higher values have also been reported. The UPDES permit for point iron discharges at Ponds 001A through 005A allows a limit of 2.0 mg/l. The State Secondary Drinking Water Regulations have a limit of 0.3 mg/l for the secondary standard. The secondary standards are recommended limits and are in place from the standpoint of aesthetic water quality concerns. The concentrations of iron as reported in the MRP are not felt to change significantly the existing or future water uses of local area streams or Scofield Reservoir.

Manganese, as with iron is listed under the State Secondary Drinking Water Standards as an aesthetic parameter (with a limit of 0.05 mg/l) but not under the Primary Standards, nor within the UPDES standards. Reported values for manganese from samples taken from surface water stations have been as low as 0.001 and as high as 7.15 mg/l. It is not felt that the concentrations

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

of manganese found within local surface water stations will alter significantly the existing or future water uses of receiving water systems.

No biomonitoring requirements are set forth within the current UPDES permit dated August 19, 1992. Statements within the UPDES permit related to this issue state that "Since Valley Camp of Utah has been conducting Whole Effluent Toxicity (WET) testing since 1988 with no indication of toxicity. Valley Camp of Utah will not be required to conduct Whole Effluent Toxicity (WET) at this time."

No construction activities are planned for the Valley Camp mining operation beyond the existing disturbance boundary presently permitted. Should any begin, the applicant agrees to submit a monitoring plan which is agreeable to the regulatory agency. Such a plan would include weekly measurements for total suspended solids and total settleable solids. Other water quality parameters to be monitored during any future construction activities will be set by the applicant and the regulatory agency. The surface water quality monitoring program is outlined in detail in Table 731.211a. From the table, both the parameters to be monitored as well as the timing of monitoring can be identified.

UPDES Discharges

There are six UPDES discharge points located on the Valley Camp permit area. All six discharge points are associated with sedimentation and filter ponds used in conjunction with surface water and mine water containment facilities installed for the mining operation. The discharge points associated with the Valcam Loadout Facility include UPDES numbers 001A, 002A, and 003A which are associated with runoff and Sediment Control Ponds 001A, 002A, and 003A respectively as shown on Map 731.720a. Discharge points for all three ponds are at the outlets of each respective discharge spillway. UPDES discharge points located with runoff control and Sediment Pond 004A, dugout D-1 and Filter Pond 005A are found in the Belina mine area as shown on Map 731.720d. The discharge location for Pond 004A and dugout D-1 are at the east of the ponds at the spillway outfall. The discharge location for Filter Pond 005A is the parshall flume located at the pond outfall located on the south side of the pond (this pond will be removed after the deep mine is mined out and the surface mine operation begins). Dugout D-1 will replace Filter Pond 005A and use its UPDES discharge point. This is per Mike Herkimer of Division of Water Quality. Abbreviated specifics related to the UPDES permit are summarized on Table 731.221a. A complete copy of the permit is included in Appendix 750.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

TABLE 731.221a
UPDES (UT-0022985) WATER QUALITY SAMPLING REQUIREMENTS

PARAMETER	30-DAY AVERAGE	7-DAY AVERAGE	DAILY MAXIMUM	MEASUREMENT FREQUENCY
Flow, gpd[1]	N/A	N/A	N/A	Twice Monthly
TSS, mg/L	25	35	70	Twice Monthly
Total Iron, mg/L	N/A	N/A	2.0	Monthly
TDS, mg/L	N/A	N/A	700	Monthly
Oil & Grease, mg/L	10	10	10	Monthly
pH	>6.5 & <9.0	>6.5 & <9.0	>6.5 & <9.0	Monthly
Floating Solids	Trace Only	Trace Only	Trace Only	N/A
Visible Foam	Trace Only	Trace Only	Trace Only	N/A
Sanitary Wastes	None	None	None	N/A
Acute Toxicity from 005A	None	None	None	As Required by Dept. of Health
Settleable Solids, mL/L	0.5	0.5	0.5	See Note 2

1. The flow measurement from discharge point 005A is taken via a reading from a discharge flume. Other discharge points may be measured via a depth of flow reading over the top of the respective discharge structure. Should safety considerations make these measurement locations nonaccessible, flows will be estimated by measuring the discharge depth exiting each pond spillway discharge pipe. The depths so taken will be converted to flow rates to comply with this requirement.

2. To be measured during any overflow or increase in discharge volume caused by precipitation or snowmelt of equivalent volume (including bypass systems) from an event less than or equal to a 10-Year 24-Hour event. This parameter is not applicable to Filter Pond 005A as per UPDES Permit Part I.B.4.

Water quality and flow data from each of the UPDES discharge locations is submitted monthly to the Utah Bureau of Water Pollution Control as required. A review of discharge data from each sampling location over the last five years (January 1985 through June 1990) indicates that Ponds 001A through 003A did not discharge. Pond 004A discharged continually from January 1985 until July 1986 whereafter it is recorded to have only discharged twice, once in May of 1988 and again in April of 1990. Filter Pond 005A (a mine discharge filter pond) discharged continually throughout the five year period.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

A review of data shows that only once in the last four years have the ponds had a discharge parameter higher than specified in the UPDES discharge permit. The exceedence occurred in September of 1988 at which time a suspended solids value of 78 mg/l was recorded. The maximum amount allowed according to the permit is 70 mg/l. The cause of the exceedence is not known. Other exceedences did occur within both Ponds 004A and 005A prior to June of 1986 involving suspended solids, oil & grease, iron, and TDS. A review of statistical data for Ponds 004A and 005A is given in Table 731.221b.

A careful review of data shows some slight trends in the data that are worth noting for Filter Pond 005A. First, discharge flows generally dropped from an average monthly value of 200 gpm during 1985 and 1986 to approximately 100 to 150 gpm in 1987. In 1988 and the first half of 1989 flows were recorded to again rise slightly, whereafter they again dropped to an average monthly value of approximately 100 gpm. Matching the period of high flows with other data shows that both suspended solids and oil and grease show their highest readings during these same time periods. Insufficient discharges have occurred from Pond 004A to make any similar data comparisons. Compiled data and associated statistics for the parameters discussed for Ponds 004A and 005A are submitted along with other water quality data for surface and ground water monitoring stations in Appendix 722.100a.

TABLE 731.221b
UPDES (UT-0022985) WATER QUALITY DISCHARGE STATISTICS
(Jan 1985 thru Jun 1990)

STATION	PARAMETER	UNITS	STATISTICS			
			MINIMUM	MAXIMUM	AVERAGE	STANDARD DEVIATION
Pond 004A	Flow	gpm	0	140	17	33
	pH	-	7.32	8.60	7.76	0.33
	Suspended Solids	mg/l	3.20	251.00	37.63	54.11
	Oil & Grease	mg/l	0.40	8.00	1.48	2.06
	Iron (Total)	mg/l	0.04	2.96	0.97	0.70
	TDS	mg/l	372	1340	655	235
Filter Pond 005A and Dugout D-1 Replaces 005A	Flow	gpm	45	382	191	76
	pH	-	6.70	8.70	7.69	0.24
	Suspended Solids	mg/l	1.50	81.00	19.51	20.23
	Oil & Grease	mg/l	0.40	15.40	2.57	2.85
	Iron (Total)	mg/l	0.05	4.38	0.56	0.63
	TDS	mg/l	349	680	501	76

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

As requested, UPDES reporting will continue to be copied and submitted to UDOGM on a monthly basis as defined in the permit for the Utah Department of Health. Violations to the permit as given in the preceding table and as outlined in Appendix 750 which seriously endanger health or the environment must be reported to the EPA, Region VIII, Emergency Response Branch in Colorado as soon as possible but in no case longer than 24 hours. Other less serious violations, their timing and reporting requirements can be reviewed in the accompanying appendix material submitted with this permit as identified above.

731.222. DETERMINATION OF MINING IMPACTS.

Water quality data collected through the surface and ground water monitoring program outlined herein will be used to identify impacts resulting by mining through graphical and statistical analyses completed on a yearly basis as described herein. Selected data will be plotted on time graphs for individual water samples over a moving five year period of record to identify the occupancy of trends in the data. If an undesirable trend is believed to be occurring, further evaluations will be conducted including statistical trend analyses. Should the analyses completed indicate that trends do exist, a more in-depth study will be conducted to identify the source of the trend and whether the trend is acknowledging a condition outlined in the PHC. Solutions will be investigated which may potentially decrease or reverse negative trends. Water quality parameters which are anticipated for use in these surface water trend analyses include Flow, Oil & Grease, pH, Iron, TDS, TSS and the Anions-Cations.

As an additional aid to monitoring the potential impacts due to mine dewatering or subsidence, spring depletion curves will be prepared for each spring on an annual basis. These curves will be plotted for at least the previous five years so that trends may be identified over time.

731.222.1 thru 222.2. ADDITIONAL MONITORING REQUIREMENTS.

The additional monitoring requirements for 731.222.1 are met as shown in Table 731.211a. Requirements of 40 CFR Parts 122 and 123, 751, and by the Utah Division of Environmental Health for National Pollutant Discharge Elimination System (referenced herein as UPDES) permits are being met as discussed in Section 751. Additional details related to the locations of UPDES discharge locations and water quality requirements are given in Section 731.221.

731.223. SURFACE WATER MONITORING SUBMITTALS.

Surface water quality and quantity data will be submitted regularly to UDOGM as required under this regulation on a quarterly basis. Data showing noncompliance of the permit conditions will continue to be brought immediately to the attention of UDOGM, with follow up action as required under 145 and 731. Annual reports will be submitted which will analyze any variance in flow and water quality characteristics.

731.224 thru 731.224.2. MONITORING THROUGH BOND RELEASE.

Water quality monitoring of surface water sampling locations will begin one year after the cessation of mining activities. The monitoring program will include those parameters shown

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

in the Table 731.211a under the standard monitoring program. The monitoring program will include two samples per year, one during high flow and the other during low flow, and will continue until termination of bonding unless modified through subsequent permit renewals or through action by the regulatory agency.

731.225. INSTALLATION/REMOVAL OF MONITORING EQUIPMENT.

No permanent structures exist within the permit area, which are used in conjunction with monitoring the quality and quantity of surface water with the exception of the discharge flume for Filter Pond 005A. This pond is located in the Belina mine area and collects pumped discharge water from Belina mine workings. The parshall flume will be maintained throughout the period of mining in order to continue to obtain flow discharge data from the mine, and will be removed as part of the surface mining operation. All other flow or monitoring equipment is portable and is carried to and removed from each sampling site during monitoring periods.

Field and laboratory equipment utilized for water quality monitoring will include, but not be limited to pH, DO, conductivity, and other such meters as required to obtain certifiable results. An independent testing lab will provide documentation, upon request, that certified testing procedures are used for off-site quality monitoring. Quantity monitoring of all surface water will be measured by the use of V-notch weirs and/or flow meters including Gurley, Pigmey or Magnetic Flow meters.
All monitoring equipment which would potentially be used for the purpose of measuring water quality and or quality of surface water will be properly installed, maintained, operated during the mining process, and will be removed when no longer needed.

731.300 thru 731.320. ACID AND TOXIC FORMING MATERIALS.

Testing has been performed on the core from BCC-1 drilled in April, 2001. The results of the testing on this core are located in Appendix 6-1. The hole was drilled to characterize the materials that will be disturbed during the surface mining operation at the White Oak Complex. To summarize the results, the material in the over burden and interburden have a net neutralizing capacity and none of the results indicated a potential for toxic metal leachate from the waste rock. The coal test results are found in Appendix 623.100b. The coal was found to be in the good range and not an acid causing problem.

Spot testing with HCl will occur on rocks that occur in the highwall cross-section that do not appear in the general lithology of the BCC-1 corehole. If the reaction is a fizzing no further testing will be done. Otherwise, samples will be sent for testing to determine whether the material meets the criteria as non toxic and non acid forming. Until test results are available, the suspect material will be mixed with neutralizing rocks and placed were it is not on the immediate surface of the re-graded material.

Prior to the placement of topsoil, the rough regraded slopes and the material left in the temporary spoil storage pile will be tested on one sample per 5 acres and 1 sample per drainage. If any of these samples return with parameters outside the acceptable range, the area around the unacceptable site will be re-sampled to determine the extent of the problem. The material left in the temporary spoil storage pile will be used to cover the problem area with at least 4-foot of

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

additional non-toxic material. Otherwise the surplus material will be used to reduce grades and to create additional grade brakes.

This program will be initiated in cooperation with the regulatory agency to address areas of concern as outlined in Sections 731.310 through 731.320.

731.400. TRANSFER OF WELLS.

The applicant agrees that all exploratory and monitoring well which may be installed prior to the time of cessation of mining will be sealed in a safe and environmentally sound manner in accordance with Sections 631, 738, 765, and current State of Utah "Administrative Rules for Water Well Drillers" requirements. The applicant will obtain from UDOGM the permission to transfer existing wells to another party should it be desired to do so in the future. Such a transfer will comply with Utah and local laws and the applicant will remain responsible for the proper management of the well until bond release as outlined in Sections 529, 551, 631, 738, and 765.

731.500. DISCHARGES.

731.510 thru 731.513. DISCHARGES INTO AN UNDERGROUND MINE.

During the operation of the underground mines, all mine portals and surface runoff facilities are situated such that discharges into the underground mines are not possible. Discharges pumped from the underground workings were directed to Filter Pond 005A before discharge into Whisky Creek. The surface mining operation will make contact with openings developed by the underground mine. Those openings, not closed by broken rock material from the blasting, will have additional broken rock pushed into the openings to prevent access and reduce water flows into the underground workings. MSHA has approved minor water flows into the inactive workings of the underground mines contacted by the surface mining operation. See Appendix 7-2.

731.520 thru 731.522. GRAVITY DISCHARGES FROM AN UNDERGROUND COAL MINE.

All mine portals are situated upgradient from all mine workings, and are thereby protected from gravity mine wastewater discharges. A review of geologic cross sections indicates that both Belina coal seams (Upper and Lower O'Connor seams) dip to the west and south away from the mine portals. East-west cross sections available within the geologic section of this permit indicate that both coal seams drop in elevation from east to west an approximate 150 to 300 feet. In the area south of the Belina portals it is found that the coal seams dip to the south an approximate 200 feet. The presence of numerous cracks, fissures, and faults throughout the mine are believed to be extensive enough to convey all mine water into subsurface stratum. Hydraulic heads required to discharge water from the mine portals are therefore not believed possible within the mine.

Any information related to post mining sealing of the mine portals is discussed in Section 500 of the MRP.

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

731.600 thru 731.620. STREAM BUFFER ZONES.

Where possible, all coal mining facilities are located with at least the required 100 foot stream buffer zone. A few areas within the Mine Permit Area are not able to comply completely with this regulation due to prelaw conditions at the mine. Also in this revision a portion of this proposed surface coal removal area will effect a portion of the Whisky Creek stream (refer to the stream alteration information for details Appendix R2). The prelaw areas not able to comply can be identified by inspection of the respective hydrologic surface mapping. The major prelaw area not able to meet this regulation is located near the entrance to the Valcam Loadout Facility at the point where Mud Creek crosses under the highway and infringes upon Sediment Pond 002A. A plan view of this area is shown on Valcam Sediment Control Facilities Map 731.720a.

Four stream buffer zone signs have been placed within the Valcam Permit Area, and four were placed within the Belina Permit Area during the underground operation. The four signs placed at the Valcam Loadout Facility are all located east of Mud Creek along the western edge of mine accessible areas as shown on Map 731.720a. Those stream buffer zone markers placed within the Belina Permit Area were located along Whisky Creek. They were located at the road crossing at the west end of the mine area, two along the upper reaches of the creek before it flows into Culvert C-40-42, and the fourth was located along the embankment of Sediment Pond 004A. These signs are to be removed in conjunction with the surface mining operation at the White Oak Complex and approved stream alteration permit for upper Whisky Creek.

The Whisky Creek will be disturbed, relocated and restored according to the stream alteration permit and the details provided in Appendix R2. Whisky Creek water flow in the disturbed area will report to Dugout D-1 to control the expected high sediment volume in the construction zone. The stream has been surveyed in its present state to determine the structures, meanders, channel widths and depths, cross-section of the stream flood zone in each different slope reach of the stream. This information will be used in the restoration of the stream channel by applying the data to the new slope reaches that correspond with the old stream. The gravels will be collected during the topsoil removal process and stored separately for redistribution into the restored channel, rocks and tree trunks will be saved to be reinstalled as drop structures. See cross-sections and pictures included in the Stream Restoration Plan section of the permit. The stream restoration design will comply with R645-301-742.300 by being constructed with stable banks, provide channel widths and depths to prevent flooding that could cause property damage, utilizing natural materials for drop structures, control additional suspended solids to streamflows outside the permit area.

During the surface mining process the upper Whisky Creek drainage will all report to Sediment pond Dugout D-1. As the active mining pit passes through the stream channel, the active pit will be the sedimentation pond and excess water will be pumped to Dugout D-1 for discharge. No temporary diversions will be constructed to bypass the stream flow during the mining process.

The water quantity and quality will not be adversely affected by coursing the stream during the mining, construction, restoration, and revegetation period through a sediment pond. Along with the use of sediment control devices like straw bales and siltation fencing to reduce erosion sediment from silting in the newly constructed channel.

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

The unnamed drainage to the south of Whisky Creek will be adjacent to the surface mining operation and within 100 feet of the mining activity. Materials from the mining activity will be kept out of this drainage and in the event material from the mining activity reaches this drainage it will be promptly removed as weather permits.

731.700. CROSS SECTIONS AND MAPS.

731.710. LOCATIONS OF WATER SUPPLY USER INTAKES.

Only one water user supply intake is known to exist for current surface water users which flows into, out of and within the Mine Permit Area. This diversion is a relatively new diversion located within the northern reaches of the Valcam Permit Area as shown on Map 731.720a. The diversion is owned by Robert Radakovich of Price, Utah, and is diverted via a diversion structure and corrugated metal pipe. The diverted water is used for downstream pasture irrigation purposes.

Other diversions exist downstream of the Mine Permit Area and are used by local land owners to irrigate fields and pasture land. The location of each water right diversion can be identified by reference to Map 724.100a and Plate 7-1 (Section 10) which shows the locations of water rights for the general vicinity. Specific diversion locations between the Valcam Loadout Facility and Scofield Reservoir are identified by small triangles along with the associated water right number. Specific information related to each water right, including owner, use, location, etc., is found in Appendix 722.100c.

731.720. LOCATIONS OF SURFACE RUNOFF/CONVEYANCE AND TREATMENT FACILITIES.

Maps showing all surface water diversion, collection, conveyance, treatment, storage and discharge facilities are included as Sediment Control Facilities Maps 731.720a through 731.720d. Map 731.720a includes the runoff conveyance facilities for the Valcam Loadout Facility and General Office Area. Maps 731.720b and 7731.720c include areas associated with the Belina Haul Road between Eccles Canyon and the Belina Mines. Map 731.720d covers the area associated with the Belina Mines. Additional surface water information related to runoff, conveyance, and treatment facilities is given in Section 742. Locations of water diversions, collection, conveyance, treatment, storage and discharge facilities related to other facilities (not a part of the surface water hydrologic control facilities such as sewage treatment, mine discharge, bypass lines, yard drains, etc.) are discussed within Section 500 of this permit.

MAP 731.720a. Valcam Sediment Control Facilities
MAP 731.720b. Lower Haul Road Sediment Control Facilities
MAP 731.720c. Upper Haul Road Sediment Control Facilities
MAP 731.720d. Belina Sediment Control Facilities

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

731.730. LOCATIONS OF WATER MONITORING STATIONS.

A map identifying water monitoring locations and elevations as required under this regulation was shown previously as Map 722.100a.

731.740. LOCATIONS OF PONDS, IMPOUNDMENTS, COAL WASTE BANKS AND EMBANKMENTS.

The only existing and/or proposed facilities requiring identification under this regulation are Sedimentation Ponds 001A, 002A, 003A, 004A and dugout D-1 already presented on Maps 731.720a and 731.720d.

731.750. CROSS-SECTIONS OF PONDS, IMPOUNDMENTS, COAL WASTE BANKS AND EMBANKMENTS.

Cross sectional details related to Sedimentation Ponds 001A, 002A, 003A, 004A, and dugout D-1 are shown on Figures 731.750a, 731.750b and 731.750g.

FIGURE 731.750a. Sediment Ponds 001A and 002A Survey Details
FIGURE 731.750b. Sediment Ponds 003A and 004A Survey Details
FIGURE 731.750g. Dugout Pond D-1 Design Details

731.760. OTHER RELEVANT CROSS-SECTIONS AND MAPS.

No other relevant cross sections and maps have been required by UDOGM.

731.800. WATER RIGHTS AND REPLACEMENT.

A contingency plan has been accepted by the applicant for the replacement of water supply to an owner of interest in the event that the water supply becomes adversely impacted by contamination, diminution, or interruption proximately resulting from the mining activities. Under such conditions, the potential alternative means of water supply listed previously in Section 728.100 would be utilized to replace the interrupted supply of any legal owner of such rights.

It is believed that the overall mining impacts upon the local water supply are, and will remain minimal, and that the two methods of water replacement discussed above for potentially affected existing water supplies will never have to be utilized or implemented.

732. SEDIMENT CONTROL MEASURES.

732.100. SILTATION STRUCTURES.

Information requested within this regulation is discussed fully in Sections 733 and 742.

732.200 thru 732.220. SEDIMENTATION PONDS.

Requirements given by this section are discussed and covered within the specific sections referenced by the regulation.

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

732.300. DIVERSIONS.

Diversion requirements specified by this regulation are discussed and met in Section 742.300.

732.400 thru 732.420. ROAD DRAINAGE.

Information related to road drainage characteristics which deal with the physical design, certification, and other related information can be found in Sections 300 and 500. Information related to surface runoff hydraulics and associated ditch design is presented within Section 742.300. Comments related to reclamation are found within the "Reclamation Plan" volume included as part of this permit submittal.

Measures to be taken to protect the inlet end of ditch relief culverts within the permit area include riprap and drop box inlets. Flows applicable to runoff control ditches are generally small and inlet protection is not required to protect against erosion. However, in some areas inlet drop boxes have been installed to aid in the collection and rediversion of runoff water. Drop box inlets located in conjunction with runoff ditches and culverts are found along the concrete ditch sections of the coal haul road between Eccles Canyon and the Belina mines, and at the inlet to culvert C-33-24.

733. IMPOUNDMENTS.

733.100. GENERAL PLANS.

General requirements of this section not discussed herein can be found within Section 742.

733.110. CERTIFICATION.

Certification as required under this regulation is provided to the best degree possible at either the head of the appropriate calculation section or on the specific design detail sheet. It must however be understood that general plans for impoundments were developed prior to the implementation of the State and Federal regulations and therefore certification as to their design and construction is limited. Certifications provided in such cases are given with respect to existing structural dimensions and visual conditions to the best degree possible. Certification related to hydraulic or hydrologic conditions or calculations are provided on respective maps, maps or appendices.

733.120. MAPS AND CROSS SECTIONS.

Sediment pond locations are identified on Maps 731.720a and 731.720d. Sediment pond cross sections and resurveyed contours are shown on Figures 731.750a, 731.750b and 731.750g.

733.130. POND DESCRIPTION.

All five sedimentation ponds collecting runoff within the Mine Permit Area are not subject unto 30 CFR 77 because of size. However, as required in the regulations, all five ponds are inspected quarterly. Extensive data related to the five ponds was compiled earlier in a report

INCORPORATED

OCT 2 6 2001

DIV OF OIL GAS & MINING

prepared by Hansen, Allen & Luce, Inc. in the spring of 1989 entitled "Analysis of Sediment Pond Design and Hydrologic Analysis of Undisturbed Area Bypass Channels and Small Exemption Areas". The information available within said report as required under this section has been incorporated into the MRP.

Three of the referenced sedimentation ponds (001A, 002A and 003A) are located within the Mine Permit Area utilized for the Valcam Loadout Facility. The fourth and fifth pond (004A and D-1) are located at the Belina Permit Area. All five sediment ponds have been constructed with 18 inch diameter vertical standpipes for both the principal and emergency spillways except for Pond 004A which uses an open channel design for the emergency spillway and for dugout D-1 which has an open channel design spillway. A summary of design criteria is provided in Table 733.130a with design flow and energy dissipation design check calculations being presented in Appendix 742.221a.

It was noted during the spring of 1989 that the principal spillway discharge pipes for all four ponds have been fitted with a short reduction section and bolted closed so as to prevent discharge. The applicant was apprized of the situation wherein it was understood that the reduction and bolted sections of the spillway outfalls would be removed by the date that this submittal was to be made to conform to the design as documented in Hansen, Allen & Luce, 1989.

An additional design change has been made to the dewatering devices for all sedimentation ponds except for dugout D-1 as a result of problems caused by winter ice buildup. Freeze-thaw and icing of pond spillways has historically damaged dewatering valves which were installed on the standpipes for pond evacuation. In order to eliminate continued maintenance and the potential for discharge violations if a valve were to crack and leak, the dewatering device is to be changed. In place of a valve, all principal standpipes have be fitted with a manual dewatering device to consist of a short pipe sleeve and screw cap which will remain in place except when the pond is to be evacuated. The screw cap has been installed on the inside of the standpipe to help protect it from ice damage. When required, the cap will be removed, and the pond will be allowed to drain. Unless emergency conditions exist, no decant cap will be removed for a minimum of 24 hours and/or until effluent limitations are met. In the event of an emergency requiring pond evacuation, UDOGM will be notified of the action and the reasons for which the action was taken. Additional descriptions related to each of the ponds is given below.

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

TABLE 733.130a
SEDIMENT POND SPILLWAY DATA SUMMARY

SED POND	EMBANKMENT CREST ELEVATION		PRINCIPAL SPILLWAY					EMERGENCY SPILLWAY				
	EXISTING MINIMUM FT.	PROPOSED MINIMUM FT.	PIPE SPILLWAY TYPE	OUTFALL+ CREST DIA. FT.	INVERT ELEV. FT.	OUTFALL++ ELEV. FT.	PIPE LENGTH FT.	SPILLWAY TYPE	OUTFALL+ CREST DIA. FT.	INVERT ELEV. FT.	OUTFALL++ ELEV. FT.	LENGTH FT.
001A	7822.0	7820.4	Standpipe	1.5	7816.1	7809.39	60	Standpipe	1.5	7818.8	7809.41	60
002A	7838.0	7837.7	Standpipe	1.5	7835.4	7826.51	74	Standpipe	1.5	7836.3	7826.43	74
003A	7868.0	7867.5	Standpipe	1.5	7863.2	7854.6	74	Standpipe	1.5	7865.5	7854.22	74
004A	8878.0	8877.9	Standpipe	1.5	8874.9	8861.35	80	Open Channel	-	8875.9	-	-
D-1	-	8877.9	Standpipe	1.5	8874.9	8861.35	80	Open Channel	-	8875.9	-	-

\+ Outfall length scaled from 1 inch = 50 foot scale maps for Ponds 001A through 003A and a 1 inch = 100 foot scale map for Pond 004A.

SEDIMENT POND 001A

Sediment Pond 001A is located toward the north end of the disturbed Valcam Permit Area as shown on Map 731.720a. In general, the pond collects surface runoff from the extreme north and eastern ends of the Mine Permit Area. Runoff originating within the eastern half of the Mine Permit Area is collected via two convenience ditches (D-1 and D-2) which run parallel to the railroad tracks. In addition to the convenience ditches, the railroad tracks themselves provide a hydrologic barrier. The railroad facility and associated ditches generally bisect the Mine Permit Area in a north and south direction as shown on the map.

Pond 001A is an irregularly shaped sedimentation pond located along the eastern edge of the Mud Creek flood plain with a cross dimension of approximately one fifth its length as shown on Map 731.720a, and Survey Detail Map 731.750a. The new interior and exterior contours shown on the survey detail map were prepared shortly after sediment was removed in October of 1988. Newly prepared Stage-Capacity and Discharge Rating Curves are shown in Figure 731.750c.

FIGURE 731.750c. Pond 001A Stage-Capacity and Discharge Rating Curve

Sediment Pond 001A is fitted with both a principal and an emergency spillway which are capable of meeting the flow and storage requirements of the regulations. During a site visit in the spring of 1989, and in response to the 1990 permit renewal, a staff engineer for Hansen, Allen & Luce made a visual survey of the pond related to historic hydraulic performance. It was noted that at that time, both the principal and emergency spillways, outlet onto a riprap apron containing an average rock size of approximately four to six inches. It was also noted that no erosion was evident at the outlets to either discharge pipe. Site evidence helps verify the calculations made which indicate that adequate erosion protection has been provided for the maximum historical event passing through the pond.

Subsequent to the removal of sediment from Pond 001A in the fall of 1988 it was noted that water was being collected within the pond. A survey of water elevations within the pond and along the adjacent creek bed was conducted in November of 1989 and again in September of 1990 to determine the possible source of the water. Survey results indicated at that time that the water level within the pond was at the same elevation as that in the creek along the south end of Pond 001A (recorded at an elevation of 7808 feet in 1989 and at 7809 feet in 1990). It is believed that the water reflects the natural local ground water table as connected to the adjacent creek system. The water contained within the pond is not anticipated to have any negative effects upon pond operation since the volume of water contained therein is well within the volume specified for sediment storage. Water now found within the volume reserved for sediment storage will be replaced by inflowing sediments through time. This process will continue until sediment levels rise above local ground water tables.

SEDIMENT POND 002A

Sediment Pond 002A is located at approximately the mid section of the disturbed Valcam Permit Area, and immediately north of the entrance to the facility as shown on Map 731.720a. In general, the pond collects surface runoff from the western side of the railroad tracks and Mine Permit Area including the area in the vicinity of the Valcam bathhouse and Western Coal Carriers Shop (on the north) to the northern half of the stockout tube on the south as shown on the map. Runoff originating within the disturbed area is collected via small convenience ditches which enter the pond from the east and south. The railroad tracks located east of the pond provide a hydrologic barrier thereby preventing runoff from areas tributary to Ponds 001A or 003A from intermixing with Pond 002A inflows.

Pond 002A is a small triangular shaped sedimentation pond located adjacent to State Highway 96. New interior and exterior contours (shown on Survey Detail Figure 731.750a) were prepared shortly after sediment was removed in October of 1988. Newly prepared Stage-Capacity and Discharge Rating Curves are shown in Figure 731.750d.

FIGURE 731.750d. Pond 002A Stage-Capacity and Discharge Rating Curve

Sediment Pond 002A is fitted with both a principal and an emergency spillway which are capable of meeting the flow and storage requirements of the regulations. During a site visit in the spring of 1989, and in response to the 1990 permit renewal, a staff engineer for Hansen, Allen & Luce made a visual survey of the pond related to historic hydraulic performance. As with Pond 001A, it was noted that both the principal and emergency spillways outlet onto a riprap apron. The average rock size contained within the apron is approximately five inches. It was also noted that no erosion was evident at the outlets to either discharge spillway. Local vegetation surrounding the spillways likewise indicates the absence of erosion, and the adequacy of design based upon the maximum historical event passing through the pond, and based upon design calculations provided in Appendix 742.221a.

One area of concern related to Pond 002A is the potential for erosion to occur on the western outer embankment adjacent to Mud Creek. Flows within Mud Creek are diverted from the west side of State Highway 96 to the east side via a culverted creek crossing. Both the road crossing and sediment pond have been in place for a number of years without incident, however recent modifications made to the creek by non mining personnel (believed to be associated with the fish and game department) appear to be having some negative impacts upon the pond. Concrete road

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

barriers have been placed within the creek at the outlet of the highway culvert. It is understood that these barriers were an attempt to provide for a more suitable fish habitat by 1) slowing culvert velocities sufficiently to allow small fish to migrate upstream through the culvert, and 2) provide a pool habitat at the outlet to the highway culvert. Both wildlife objectives have apparently been met by the installations, however hydraulic consequences may be realized.

The road barriers were placed in Mud Creek through the use of a small crane which lifted the barriers out into the creek. It is understood that in an attempt to place one of the barriers on the far side of the creek, the crane being used became unstable, and the barrier had to be dropped to prevent the crane from tipping over. The dropped barrier ended up in such a position that it redirects a portion of the creek flows into the embankment rather than protecting it. During high flow periods, this situation could result in unnecessary erosion damage to Pond 002A. Valley Camp of Utah has planned to relocate any questionable concrete road barriers placed by non mining personnel in order to reduce existing erosion potentials.

In order to protect the embankment from additional erosion, large diameter riprap has also been placed along the stream side embankment of Pond 002A at the locations directly impacted by Mud Creek flows. Subsequent to installation of the riprap, the embankment will be visually inspected quarterly to monitor its effectiveness as a deterrent against creek erosion. Should erosional problems become evident, UDOGM will be notified, and corrective actions will be taken to remedy the situation.

SEDIMENT POND 003A

Sediment Pond 003A is a small rectangularly shaped sedimentation pond located adjacent to State Highway 96 at the far south end on the disturbed Valcam Permit Area immediately south of the Valcam stockpile tube as shown on Map 731.720a. In general, Pond 003A collects surface runoff from the small disturbed area south of the stockpile tube and crusher building as shown on the referenced map. Runoff originating within the disturbed area is collected via small convenience ditches which enter the pond from the north. Runoff originating along the eastern side of the railroad tracks is diverted to the pond via a 24 inch CMP culvert located north of the conveyor belt as shown. The new interior and exterior contours shown on Survey Detail Figure 731.750b was prepared shortly after sediment was removed in October of 1988. Newly prepared Stage-Capacity and Discharge Rating Curves for Pond 003A are shown in Figure 731.750e.

FIGURE 731.750e. Pond 003A Stage Capacity and Discharge Rating Curve

Sediment Pond 003A is fitted with both a principal and an emergency spillway which are capable of meeting the flow and storage requirements of the regulations. During a site visit in the spring of 1989, and in response to the 1990 permit renewal, a staff engineer for Hansen, Allen & Luce made a visual survey of the pond related to historic hydraulic performance. As with Ponds 001A and 002A, it was noted during the site visit that both the principal and emergency spillways exit onto a riprap apron containing an average rock size of approximately two to four inches. It was also noted that no erosion was evident at the outlets to either discharge spillway. The absence of erosion indicates the adequacy of design based upon the maximum historical event passing through the pond, and based upon design calculations provided in Appendix 742.221a.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

SEDIMENT POND 004A

Sediment Pond 004A is a small roughly square shaped sedimentation pond located at the eastern end of the Belina Permit Area as shown on Map 731.720d. Pond 004A collects surface runoff from the majority of the disturbed areas at the Belina Mines (refer to the sub-watershed map 742.310b). Runoff originating within the disturbed area is collected via numerous small convenience ditches which enter the pond along its southwest corner. Undisturbed area runoff passes through the pond and eventually ends up in Whisky Creek. New interior contours as shown on Survey Detail Figure 731.750b are based upon conditions shortly after sediment was removed in October of 1988. Newly prepared Stage-Capacity and Discharge Rating Curves for Pond 004A are shown in Figure 731.750f.

FIGURE 731.750f. Pond 004A Stage Capacity and Discharge Rating Curve

Sediment Pond 004A is fitted with both principal and emergency spillways. The principal spillway consists of a vertical standpipe, the emergency spillway consists of a channel overflow. Combined, they are capable of meeting the flow and storage requirements of the regulations. During a site visit in the spring of 1989, and in response to the 1990 permit renewal, a staff engineer for Hansen, Allen & Luce made a visual survey of the pond related to historic hydraulic performance. At the time of the site visit, the applicant was in the process of reconstructing the emergency spillway in response to wildlife damage noted in the structure. A subsequent site visit confirmed that the spillway repairs had been completed by the applicant. Both the principal and emergency spillways exit onto the downstream slope of the sediment pond onto a rip-rapped embankment.

SEDIMENT DUGOUT D-1

Sediment Pond Dugout D-1 is a small rectangular shaped sedimentation pond that will be located at the Southern end of the mine area. The dugout will be built prior to the removal of topsoil in the upper Whisky Creek area of the surface mining. (Refer to Map 742.310b for location). Dugout D-1 collects surface runoff from all disturbed and undisturbed areas upstream of its location. The dugout D-1 will be built according to the designs submitted in this revision and will be certified by a Licensed Professional Engineer of the state of Utah.

FIGURE 731.750h. Dugout Pond D-1 Stage-Capacity Curves

FILTER POND 005A

Filter Pond 005A is located south of the Belina Mine portals adjacent to the fan portal and is used exclusively for the improvement of mine discharge water. The pond is a five cell concrete unit with a design capacity of 250 gallons per minute. It provides primary settling, three stages of filtration, and a final clarifier. Design details were submitted to both the Utah Division of Oil, Gas & Mining; and the Utah State Department of Health in 1981, and after having received approval, the pond was constructed in the third quarter of 1983. The discharge structure associated with the pond is a Parshall Flume and corrugated metal pipe which discharges mine waters into Whisky Creek above the inlet to Culvert C-40-42. The location of Filter Pond 005A and the discharge culvert are shown on Map 731.720d. Plan and section views of Filter Pond 005A are included in Appendix 742.221a.

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

In October, 1986, approval was given for the installation of a 6 inch abandoned section water bypass line. This line discharges at the same location as Filter Pond 005A beyond the Parshall Flume. This line originates at the seals in the First East Mains section of the Belina No. 1 Mine. Water collected behind these seals originates from shallow seepage at the mine entrance and is pumped to the point of discharge.

Filter Pond 005A will be removed upon the initiation of the surface mining activities at the White Oak Mine complex.

733.140. SUBSIDENCE SURVEY.

None of the five sediment ponds located within the Mine Permit Area lie above mine workings, nor are they in the zone of influence of subsidence and therefore are not susceptible to the potential effects of subsidence.

A stipulation in the 1999 modification to lease U-017354 is that no subsidence is to occur due to mining activities. Therefore, the mining plan reflects a "no subsidence"recovery plan approved by the BLM per the Joint Decision Memo included as Attachment A to Section 10 of this M&RP. Subsidence monitoring locations have been shown on Plates 5-1A and 5-1B. Refer to Section 521.142 for additional discussion of subsidence.

733.150. HYDROLOGIC AND GEOLOGIC INFORMATION.

Preliminary hydrologic and geologic information as required by this section is found within the geologic and hydrologic impacts sections of this permit.

733.160. FUTURE DESIGN PLAN CERTIFICATION STATEMENT.

No future designs are anticipated for the Mine Permit Area beyond those submitted with this revision.

733.200. PERMANENT AND TEMPORARY IMPOUNDMENTS.

733.210. CONSTRUCTION REQUIREMENTS.

All five sedimentation ponds located within the Mine Permit Area are small in nature and are exempt from the requirements of 30 CFR 77. Certification of the hydrology and hydraulics of the ponds is given in a general statement at the beginning of Section 700. Certification related to the construction methods is not available as required in 514.300, however, general certifications statements for each of the ponds is given on Figures 731.750a, 731.750b and 731.750g. Each pond is inspected quarterly as required in 514.300, and available geotechnical information related to the ponds is presented in Appendix 742.221b.

733.220 thru 733.226 PERMANENT IMPOUNDMENTS.

No permanent impoundments are planned for the Valley Camp permit area or mining operation.

INCORPORATED

OCT 2 6 2001

DIV OF OIL GAS & MINING

733.230. AUTHORIZATION OF TEMPORARY IMPOUNDMENTS.

All temporary impoundments and or detention basins have been authorized as required by UDOGM.

733.240. POTENTIAL HAZARD NOTIFICATION.

The applicant agrees to notify UDOGM according to 515.200 should a potential hazard to the impoundment be disclosed.

734. DISCHARGE STRUCTURES.

Information related to discharge structures is provided in Section 742.

735. DISPOSAL OF EXCESS SPOIL.

A spoil disposal area is permitted at the White Oak Mine Complex. See Section 9 and Map R645-301-521.150 Sheet 4 of 4. However, all spoil and waste materials detected or encountered at the time of reclamation will be placed in suitable locations within the affected area(s) to ensure stability and or to prevent leaching. The placement of such materials found during reclamation (if any) will depend upon the location in which the material was encountered, and will be placed in appropriate locations and covered with four feet of non toxic material as determined jointly by White Oak and UDOGM.

736. COAL MINE WASTE.

No coal mine wastes exist within the Mine Permit Area as defined by UDOGM definitions.

737. NON-COAL MINE WASTE.

See information provided in Section 747.

738. TEMPORARY CASING AND SEALING OF WELLS.

The casing and sealing of wells is discussed in Sections 631 and 748.

740. DESIGN CRITERIA AND PLANS.

741. GENERAL REQUIREMENTS.

742 thru 742.126. SEDIMENT CONTROL MEASURES.

Sediment control measures incorporated within the Mine Permit Area include the 1) diversion of disturbed and undisturbed area waters, (except for the sediment structures at the Belina mine site) 2) the construction of straw pits which collect and control runoff, 3) the use of natural depressions located within the Permit Area, 4) the continued growth of natural vegetation, 5) the paving of dirt roadways, 6) the revegetation of disturbed areas, and 7) the

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OCT 26 2001
DIV OF OIL GAS & MINING

installation of riprap, rock gabions, sediment basins, straw bales and silt fencing. Throughout much of the Mine Permit Area, the ditch and culvert installations consist of what the applicant considers convenience ditches and culverts. These convenience structures have been installed to maintain relatively dry road conditions, and to prevent runoff from concentrating at truck crossings. Additional details related to these structures is provided in Sections 742.200 through 742.423.5 and in Section 750.

Sediment removed from sedimentation ponds will be tested for toxicity and retained at the site where the pond was cleaned to be used as reclamation fill material. The material from Pond 004A and Dugout D-1 will be kept on the south end of the coal storage area near the removed Belina No.2 Mine Fan.

742.200 thru 742.214. SILTATION STRUCTURES.

Applicable regulations as required in these sections are met through the information provided in Section 742.220. The sediment ponds located on the Mine Permit Area are not subject to 30 CFR 77.

742.220. SEDIMENTATION PONDS.

742.221 thru 742.221.39. GENERAL REQUIREMENTS.

Presented below are the methodologies used in the analysis of Sediment Ponds 001A through 004A and dugout D-1, the analysis and design of runoff conveyance facilities, and the results of the analyses pertaining to the regulatory requirements. Information available in the 1988 report prepared by Hansen, et. al, 1989 has been incorporated into this permit to facilitate the presentation of material applicable to the MRP. Survey details for each pond (including pond contours and critical cross sections) are shown on Figures 731.750a, 731.750b and 731.750g.

DESIGN METHODOLOGY

Runoff Volume

The storage volume in each existing sedimentation pond was analyzed to determine if there is sufficient storage to contain runoff from the 10-year 24-hour event without resulting in discharge through the principal or emergency spillways. The technique used to calculate the required volume is described below.

The runoff depth resulting from a given rainfall depth was determined using the runoff curve number technique, as defined by the U.S. Soil Conservation Service (1972). According to the curve number methodology, the relationship between storm rainfall, soil moisture storage, and runoff can be expressed by the equations:

$$Q = \frac{(P - 0.2S)^2}{P + 0.8S} \qquad (1)$$

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

$$CN = \frac{1000}{10 + S} \quad (2)$$

where:

Q = direct runoff depth, inches;
P = storm rainfall depth, inches;
S = maximum infiltration depth (defined as the maximum possible difference between P and Q), inches; and
CN = curve number, dimensionless.

Use of Equations 1 and 2 requires the selection of a curve number, which is a function of vegetative cover and the hydrologic soil groups. Curve numbers for the study area were selected from information provided by the USDA Soil Conservation Service (1972), by U.S. Bureau of Reclamation (1977), and from personal hydrologic judgment following field observation. Volume weighted curve numbers were used for heterogeneous areas.

Values of precipitation (P) were selected for the design return periods from Richardson (1971), using the Clear Creek precipitation frequency data based on a 24-hour storm. A rainfall return period of 10 years was used for pond design, and a return period of 6 years was used for ditch and culvert design.

Equation 1 is based on the assumption that Ia = 0.2S, where Ia is the initial abstraction from storm rainfall, defined as the rainfall which must fall before runoff begins (i.e., to satisfy interception, evaporation, and soil-water storage). Therefore, determination of runoff from Equation 1 is valid only when Precipitation is greater than 0.2S. Below this point, no runoff can occur. Once Q was determined from the above equation, the runoff volume for sediment pond design was calculated by multiplying the runoff depth by the drainage area.

Flow Hydrographs and Peak Discharge

The peak discharge from a given design storm was calculated for the mine area utilizing a computer program developed by Hansen, Allen, and Luce Inc. entitled "HYDRO." "HYDRO" implements the SCS Unit Hydrograph method as presented in Chapter 10 of NEH-4.

The Unit Hydrograph methodology utilizes the runoff depth equations presented earlier (Equations 1 and 2) as well as the relationships shown on Figure 742.221a, "Dimensionless Curvilinear Unit Hydrograph and Equivalent Triangular Hydrograph". A hydrograph of a single block of rainfall excess with duration D is shown in the upper portion of the above mentioned map. The lower portion of the map contains the resultant runoff hydrograph. For runoff from excess rainfall, the area under the hydrograph curve and the area enclosed by the rainfall hydrograph represent the same volume of water (Q) as calculated using equation 1.

FIGURE 742.221a. Dimensionless Curvilinear Unit Hydrograph and Equivalent Triangular Hydrograph

INCORPORATED
OCT 26 2001
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The peak flow rate for the dimensionless unit hydrograph is represented by q_p, while t_p represents the time to peak, which is defined as the flow from the start of the hydrograph to q_p. The base time (t_b) is the duration of the hydrograph. The time from the center of mass of rainfall excess to the peak of the runoff hydrograph is the lag time (t_L). The time of concentration (t_c) is defined as the time required for flow from the hydraulically most remote point in a basin to reach the basin outlet. According to the U.S. Soil Conservation Service (1972), the watershed lag is equal to 0.6 t_c and the time of concentration (t_c) is equal to 1.5 t_p. By combining these two expressions, one can see that $t_p = 1.11 t_L$ where both variables are as previously defined. The watershed lag (t_L) is defined as:

$$t_L = \frac{(h_l^{0.8})(S+1)^{0.7}}{1900\, Y^{0.5}} \quad (3)$$

where:

t_L = watershed lag, in hours;
h_l = hydraulic length, or the length of the mainstream to the farthest divide, in feet;
S =is as previously defined; and Y = average watershed slope, in percent.

Values of Y were obtained from methods outlined by Craig and Rankl (1977). The hydraulic length was taken from an appropriate topographic map, and S was determined from Equation 2 once the runoff curve number was estimated.

The peak discharge of the dimensionless unit hydrograph is defined as:

$$q_p = \frac{484\, A\, Q}{T_p} \quad (4)$$

where:

q_p = peak discharge constant, in cfs;
A = drainage area, in square miles;
Q = direct runoff depth, inches;
T_p = time elapsed from the beginning of runoff to the hydrograph peak, in hours; and
484 = a conversion factor.

The 24-hour rainfall distribution used in the analysis was the NOAA type II storm as shown in Figure 742.221b, "Twenty-Four Hour Rainfall Distributions".

FIGURE 742.221b. Twenty Four Hour Rainfall Distribution

Dimensionless unit hydrographs are developed by simulating many natural unit hydrographs using the time to peak and the peak discharge constant. Haan and Barfield (1978) proposed a dimensionless unit hydrograph based on the gamma function:

$$\frac{q(t)}{q_p} = \left[\frac{t}{t_p} e^{(1-t/tp)}\right]^{C3tp} \quad (5)$$

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

where:

$q(t)$ = hydrograph ordinate at time t, cubic feet per second; and
the parameters q_p and t_p are as previously defined, and C_3 is a parameter defined by:

$$Q = q_p\, t_p\, (e/C_3t_p)(C_3t_p)\, G(C_3t_p) \quad (6)$$

where:

Q = runoff volume (one inch for a unit hydrograph),
G = gamma function,

and all other variables are as previously defined.

Figure 742.221c, "Variation in Hydrograph Shape with Variation in C_3t_p", shows how shape of the hydrograph defined by Equation 5 changes as C_3t_p changes. The higher the value of C_3t_p, the sharper the peak of the hydrograph.

FIGURE 742.221c. Variation in Hydrograph Shape with Variation in C_3t_p

Estimates of the peak discharge to be expected from various precipitation events were made using the dimensionless hydrograph procedure illustrated on Figure 742.221a. The dimensionless unit hydrograph method involves the development of a runoff hydrograph from a complex rainstorm. The storm is divided into blocks of uniform intensity of duration D and distributed in accordance with the 24-hour rainfall distribution illustrated on Figure 742.221c. Values of D must be less than or equal to t_p. Practically, the selection of D as a multiple of t_p will ensure that the peak will be encountered.

Rainfall excess is generated from the rainfall depths of duration D, and the rainfall-runoff relationship expressed in Equation 1. The rainfall excess (runoff) from each time increment of duration D is then multiplied by the unit hydrograph ordinates to produce a component hydrograph. Each of the component hydrographs are then lagged by a time increment D and are consecutively summed to produce the synthetic runoff hydrograph.

Because individual hydrographs were not routed through conveyance structures or ponds, the synthetic peak is considered conservative. Calculated flow rates for each pond or conveyance structure using the above described methods are shown and discussed later.

Pond Spillway Capacity

Spillway capacity requirements for ponds 001A, 002A and 003A were based on runoff from the 25-year, 24-hour storm. This design event is conservative based upon the new Federal guidelines allowing the use of the 25-year, 6-hour storm. Ponds 004A and Dugout D-1 are designed on the 25-year, 6-hour storm. The 6-hour storm event is more applicable to those storm events experienced in Utah as a result of overall climate and topography. Spillway capacity requirements were determined according to the peak discharge methodology presented above.

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

The stage-discharge relationship of the corrugated metal risers and conduits used in the pond spillway design was determined from methods outlined by Haan and Barfield (1978), who indicate that the discharge of the spillway is calculated as the smallest of the possible flows due to weir flow, orifice flow, or pipe flow at any stage. The coefficients suggested by Haan and Barfield (1978) were used in the appropriate equations.

Weir flow is determined by the equation:

$$q = CLH3/2 \qquad (7)$$

where:

q = flow rate in cfs;
C = coefficient determined by entrance conditions;
L = length of the weir crest, in feet, or the circumference of the riser; in feet; and
H = head of water above the riser inlet, in feet.

The entrance coefficient (C) is determined by:

$$C = 3.27 + 0.4\ H/W \qquad (8)$$

where C and H are previously defined and W is the height of the weir crest above the channel bottom, in feet.

Orifice flow occurs when the flow is restricted by the opening. It can be determined as:

$$q = CA\ (2gH)^{1/2} \qquad (9)$$

where:

q = as previously defined;
C = coefficient dependent upon the orifice geometry (0.6 in this case);
A = cross-sectional area of the opening, in square feet;
g = gravitational constant (32.2 ft/s2); and
H = head above the orifice inlet, in feet.

Pipe flow occurs when the friction of the pipe controls the flow. According to Haan and Barfield (1978), this flow type can be described by:

$$q = \frac{A\ (2gh)^{1/2}}{(1 + K_e + K_b + K_c\ L)^{1/2}} \qquad (10)$$

where q, A, g, and H are as previously defined and:

K_e = entrance loss coefficient (1.0 in this case);
K_b = correction factor for energy loss in bends (0.5 in this case);
K_c = friction factor; and
L = pipe length, in feet.

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OCT 26 2001
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K_c can be determined by the equation:

$$K_c = \frac{5087\ n2}{d4/3} \qquad (11)$$

where:

n = Manning's roughness coefficient; and
d = inside diameter of the pipe, in inches.

The rating curve for the open channel flow spillway for Sediment Pond 004A was developed by using the weir flow equation (equation 7) with the coefficient (C) determined from tables presented in Brater and King (1976) for broad crested weirs and for weirs of trapezoidal cross-section.

The stage-discharge relationship for the emergency spillway for Pond 004A was determined from the broad crested weir equation which is defined as:

$$q = CLH^{3/2}(12)$$

where:

q = Flow rate, cfs
C = Entrance coefficient
L = Width, feet
H = Water Depth, feet

Calculations related to the design capacity of the emergency discharge spillway are included within Appendix 742.221a.

Sediment Storage Volume

The storage volume in each sediment pond was analyzed to determine if there was sufficient storage to contain the accumulated sediment volume from a three-year period. The amount of sediment to be yielded to the sediment ponds was determined from the Universal Soil Loss Equation (Israelsen et al., 1984). In accordance with this equation, soil erosion caused by water is determined from:

$$A = R \cdot K \cdot LS \cdot VM(13)$$

where:

A = computed amount of soil loss, in tons/acre/year;
R = rainfall factor, in foot-tons/acre/hour;
K = soil erodibility factor, in tons/acre/year/unit of R;
LS = topographic factor (length and steepness of slope), dimensionless; and
VM = erosion control factor, dimensionless.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

Values for R and K were determined from Israelsen et al. (1984). The topographic factor (LS) was determined from:

$$LS = \frac{65.41\ S}{S^2 + 10{,}000} + \frac{4.56\ S}{(S^2 + 10{,}000)^{0.5}} + 0.065\ (L/72.6)m \qquad (14)$$

where:

L = average overland flow length, in feet;
S = average steepness of slope, in percent; and
m = an exponent dependent upon the steepness of slope (0.3 for slopes less than 0.5%, 0.5 for slopes 0.51% to 10%, and 0.6 for slopes greater than 10%).

Values for VM were determined from the Israelsen et al. (1984).

All four sediment ponds are capable of storing at least the three year accumulated sediment requirements, and are designed so as to be cleaned when 60% of the design storage volume has been reached. The design elevations for the 60% sediment cleanout requirements are shown on Figures 731.750a, 731.750b and 731.750g. Table 742.221a has been inserted to summarize the sediment storage volume requirements as well as the projected time to 60% cleanout. The last column in the table indicates the number of years projected before the 60% cleanout elevation is reached. This value was obtained by dividing the required 60% cleanout volume by the projected 1-year sediment volume shown in column three of the table.

Based upon data shown in Table 742.221a, the applicant agrees to survey the ponds contained within the MRP every two years, unless time projections indicate that the 60% sediment storage volume will be exceeded within the two year projection, whereupon the pond will be surveyed annually. Survey data obtained will indicate the required timing for cleaning of each respective pond. As an aid to determining sediment storage, the applicant will also provide an appropriate method of determining approximate sediment storage volume. Such aids may include (but not be limited to) markings on a standpipe spillway indicating depth to 60% sediment storage, or some other post or marker placed within or adjacent to the pond. Since pond conditions vary, the method of identifying the approximate estimate of cleanout elevation must be flexible.

INCORPORATED
OCT 26 2001
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TABLE 742.221a
TIME PROJECTIONS TO 60% SEDIMENT CLEANOUT VOLUME

SED POND CLEANOUT NO.	THREE-YEAR SEDIMENT VOL. AC-FT	ONE-YEAR SEDIMENT VOL. AC-FT	AVAILABLE SEDIMENT VOL. AC-FT	60% SEDIMENT VOL. AC-FT	TIME TO 60% SEDIMENT YEARS
001A	0.93	0.31	1.35	0.81	2.6
002A	0.10	0.033	0.30	0.18	5.5
003A	0.51	0.17	0.78	0.47	2.8
004A*	0.22	0.07	1.09	0.65	8.9
D-1*	0.24	0.08	0.31	0.19	2.38

* These ponds were designed based on a 10-year, 24-hour storm event of 2.4 inches/hour. The other ponds were based on a 25-year, 24-hour storm event of 2.92 in/hour.

REQUIRED POND VOLUMES AND DETENTION STORAGE

Runoff Storage Requirements

Runoff volumes from tributary areas to the sediment ponds were determined from the SCS curve number methodology presented above. Tributary areas for Sediment Ponds 001A through 004A are illustrated on Maps 731.720a and 731.720d dugout D-1 is illustrated on Map 731.720d . Tributary areas were subdivided and classified in accordance with vegetation type and surface condition and a separate curve number was estimated for each separate classification. Tributary subareas to the sediment ponds were classified as disturbed areas for which a curve number of 90 was assumed, paved areas for which a curve number of 98 was assumed, reclaimed areas for which a curve number of 85 was assumed, sage/grass areas for which a curve number of 75 was assumed, low density forested/aspen areas for which a curve number of 70 was assumed, and high density forested/aspen areas for which a curve number of 40 was assumed. A breakdown of areas contributing to pond runoff is presented in Table 742.221b.

TABLE 742.221b
TRIBUTARY AREAS TO SEDIMENT PONDS

SED POND NO.	DISTURBED AREA AC	PAVED AREA AC	FORESTED /ASPEN AREA AC	SAGE/GRASS AREA AC	RECLAIMED AREA AC	TOTAL AREA AC
001A	8.13	-	-	3.4	-	11.53
002A	6.3	0.82	-	-	-	7.12
003A	4.0	0.18	1.65	1.0	0.25	7.08
004A	24.35	-	40.6	-	-	64.95
D-1	6.69	-	113.2	-	-	119.89

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OCT 26 2001
DIV OF OIL GAS & MINING

Based on a precipitation depth of 2.4 inches for the 10-year, 24-hour precipitation event (the design event) and the curve numbers for the various subareas presented above, a weighted curve number based on runoff volume was determined for the total tributary area for each sediment pond. Using this volume weighted curve number and the precipitation depth for the 10-year, 24-hour storm, the estimated runoff depth for each pond was predicted using equations 1 and 2 as presented in the methodology section. The runoff volume to each pond from the 10-year, 24-hour event was then predicted by multiplying the runoff depth by the tributary area to the sediment pond. The results of the estimated runoff volume to each pond from the design precipitation event are presented in Table 742.221c. This becomes the required runoff storage volume that must be present in the sediment ponds in order to totally contain the runoff from the design precipitation event.

Sediment Storage Requirements

The mean annual sediment yield to the sediment ponds was estimated using the modified universal soil loss equation as presented in the methodology section of this report. Areas were again subdivided based on characteristics of the subareas that would affect erosion, such as vegetation type and steepness of slope. Calculations for sediment yield to each pond are presented in Appendix 742.221a. The estimated 3-year sediment yield to the ponds are presented in Table 742.221c along with the runoff projections for the ponds.

A summary of sediment criteria is given in Table 742.221d. A column has been included within the table indicating the 60 percent (of available storage) cleanout elevation as requested by UDOGM.

TABLE 742.221c
ESTIMATED RUNOFF VOLUME TO SEDIMENT PONDS FROM THE 10-YEAR, 24-HOUR PRECIPITATION EVENT AND 3-YEAR SEDIMENT YIELD TO PONDS

SED POND	AREA ACRES	VOLUME WEIGHTED CURVE NUMBER	RUNOFF DEPTH INCHES	10-YEAR, 24-HOUR RUNOFF VOLUME AC-FT	3-YEAR SED YIELD AC-FT
001A	11.53	86.4	1.23	1.18	0.93
002A	7.12	91.2	1.57	0.94	0.10
003A	7.08	85.0	1.13	0.67	0.51
004A	64.95	77.9	0.75	4.07	0.22
D-1	119.59	61.1	0.18	1.82	0.24

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OCT 26 2001
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TABLE 742.221d
SEDIMENT STORAGE CHARACTERISTICS

SEDIMENT POND NO.	REQUIRED 3 YEAR SEDIMENT STORAGE (AC-FT)	AVAILABLE SEDIMENT STORAGE AC-FT	DECANT ELEVATION (FEET MSL)	60 PERCENT CLEANOUT ELEVATION (FEET MSL)
001A	0.93	1.35	7812.0	7809.7
002A	0.10	0.30	7829.0	7827.6
003A	0.51	0.78	7860.0	7858.2
004A*	0.22	1.09	8874.9	8868.9
D-1*	0.24	0.31	8987.5	8985.4

* These ponds were designed based on a 10-year, 24-hour storm event of 2.4 inches/hour. The other ponds were based on a 25-year, 24-hour storm event of 2.92 in/hour.

Available Pond Storage

A pond storage survey was conducted after the cleaning of Sediment Ponds 001A through 003A in October and November of 1988. A survey of Sediment Pond 004A was conducted in August of 1988. The surveys were conducted by mine personnel and certified by a qualified registered professional engineer. Certified survey details are shown on Figures 731.750a and 731.750b.

Survey plats showing contour data were used to prepare stage-capacity relationships for each pond during the hydraulic analysis phase of previous permit renewals. The contours presented on the plats were planimetered, from which an area for each contour was determined. Volumes were then computed by using the average end area method. The stage-capacity curves for Sediment Ponds 001A through 004A developed as a result are shown in Figures 731.750c through 731.750f. Also illustrated are the elevations of the primary and emergency spillways, the proposed elevation of the decants for the ponds, the available versus required runoff storage volume of each pond between the elevation of the primary spillway and the proposed decant level, and an indication of the available sediment storage volume below the proposed decant elevation versus the estimated 3-year accumulated sediment yield to the ponds.

As is indicated by the details presented in Figures 731.750c through 731.750f, there is sufficient storage capacity in each pond to provide for at least the estimated 3-year sediment yield to the ponds and to provide for total containment of the runoff volume from the 10-year, 24-hour precipitation event.

Pond Detention Time

The decants, which will be the dewatering devices for the ponds, will be manually operated. The ponds have sufficient storage capacity to totally contain the runoff volume from

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OCT 26 2001

DIV OF OIL GAS & MINING

the 10-year, 24-hour precipitation event between the proposed decant elevations indicated above and the primary spillways. The water level in the ponds will be maintained at or below the decant level in anticipation of a runoff producing event. The decants will also be maintained in a closed position such that during a runoff producing event (of equal or lesser magnitude to that of the design event) the runoff from the event would be totally contained by the pond. The runoff from a precipitation event will be maintained in the pond for a period of at least 24 hours and then released in accordance with the UPDES permit for the pond.

SPILLWAY CAPACITY

As indicated previously, all sediment ponds except 004A and Dugout D-1 are designed to have a combination of a principal and an emergency spillway with the capacity to safely discharge the runoff from a 25-year, 24-hour precipitation event. Ponds 004A and Dugout D-1 are designed to safely discharge a 25-year, 6-hour precipitation event of 1.9-inches/hour. The elevation of the crest of the emergency spillway is to be a minimum of 1.0 foot above the crest of the principal spillway and the minimum elevation of the top of the settled embankment is to be at least 1.0 foot above the water surface in the pond under design flow conditions for the 25-year, 24-hour precipitation event or the 25-year, 6-hour event.

All of the sediment ponds except for D-1 have principal and emergency spillways. A summary of the physical characteristics of the principal and emergency spillways for the sediment ponds is presented earlier in Table 733.130a. The principal and emergency spillways for Sediment Ponds 001A through 003A consist of 18-inch diameter corrugated metal standpipe type spillways. The principal spillway for Sediment Pond 004A consists of an 18-inch diameter corrugated metal standpipe type spillway and the emergency spillway consists of an emergency overflow open channel type spillway. Dugout D-1 has only an overflow open spillway.

Peak flow projections from the 25-year, 24-hour precipitation event of 2.92 inches were made using a computer watershed model based on the USDA Soil Conservation Service's unit hydrograph curve number methodology for this revision. Watershed characteristics, which are input parameters to the model, include the tributary areas to the ponds, volume weighted curve numbers, average watershed slope, and the hydraulic length. Peak flow projections from the 25-year, 24-hour precipitation event along with their respective watershed characteristics are presented for each pond in Table 742.221e.

Discharge rating curves were prepared for the principal spillway, the emergency spillway, and the combined spillway capacity of the principal and emergency spillways for each pond. The rating curves were derived in accordance with the methodology previously described for spillway standpipes and for the open channel spillway. Calculations and spillway rating curves for Ponds 001A through 004A can be found in Appendix 742.221a.

The peak flow projections presented in Table 742.221e were then superimposed on the spillway rating curves to determine the required water surface elevation in the pond to pass the design event. The design hydrograph from the 25-year, 24-hour precipitation event was not routed through the pond. Thus, the required head-water depth over the spillways to pass the peak flow from the design event is conservative.

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OCT 26 2001
DIV OF OIL GAS & MINING

TABLE 742.221e
WATERSHED CHARACTERISTICS AND PEAK-INFLOW TO SEDIMENT PONDS FROM THE 25-YEAR, 24-HOUR PRECIPITATION EVENT

SED POND	AREA ACRES	VOLUME WEIGHTED CURVE NUMBER	HYDRAULIC LENGTH FT.	WATERSHED SLOPE %	25-YR, 24-HR PEAK FLOW CFS
001A	11.53	86.4	2760	38.0	18.3
002A	7.12	91.2	860	17.8	13.7
003A	7.08	85.0	1100	32.0	11.0
004A*	64.95	77.9	1850	50	19.95
D-1*	119.89	61.1	2000	50	5.73

*These ponds were designed based on a 10-year, 24-hour storm event of 2.4 inches/hour.

As indicated on Figure 731.750c, the crest elevation of the emergency spillway in Sediment Pond 001A is 2.7 feet higher than the crest of the principal spillway. The combined spillways of Sediment Pond 001A can pass the peak discharge of 18.3 cfs at an elevation of 7819.35 feet. With the top of the embankment of Sediment Pond 001A set at elevation 7822.0 feet, the sediment pond can pass the design event with more than one foot of freeboard. Thus the spillway capacity of the pond is adequate as designed.

As indicated on Figure 731.750d, the crest elevation of the emergency spillway in Sediment Pond 002A is 0.9 foot higher than the crest of the principal spillway, which nearly meets the requirement for a one-foot separation between the two spillways. The combined spillways of Sediment Pond 002A can pass the peak discharge of 13.7 cfs at an elevation of 7836.7 feet, MSL. With the minimum top of the embankment of Sediment Pond 002A set at elevation 7838.0 feet, the sediment pond can pass the design event with 1.3 feet of freeboard.

As indicated on Figure 731.750e, the crest elevation of the emergency spillway in Sediment Pond 003A is 2.3 feet higher than the crest of the principal spillway. The combined spillways of Sediment Pond 003A can pass the peak discharge of 11.0 cfs at an elevation of 7864.87 feet, MSL. With the top of the embankment of Sediment Pond 003A set at elevation 7868.0 feet, the sediment pond can pass the design event with more than one foot of freeboard. Thus the spillway capacity of the pond is adequate as is.

The rating curve presented on Figure 731.750f for Sediment Pond 004A includes both the rating curves for the principal spillway, and the open-channel emergency spillway for the pond. Valley Camp personnel have surveyed the emergency channel spillway, and indicate that the channel is trapezoidal in cross-section with a bottom width of approximately 13 feet, a top width of 21.5 feet and a channel depth of 2.1 feet. The existing spillway crest for the principal spillway in Sediment Pond 004A is at 8874.93 feet and the existing crest of the emergency spillway is at

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

elevation 8875.9 feet, a difference of one foot. The 25 year, 6 hour peak stage has a combined flow capacity for both spillways of 7.81 cfs with a flow depth of 1.1 feet over the crest of the primary spillway. An embankment height under these conditions for Pond 004A of 8878.0 feet allows for the one foot of freeboard required under the regulations.

As indicated on Figure 731.750g, the crest elevation of the emergency spillway in Dugout D-1 is also the principal spillway. The spillway is trapezoidal in cross-section with a bottom width of 10 feet, a top width of 16 feet and a channel depth of 1.5 feet. The spillway of Dugout D-1 can pass the peak discharge of 3.35 cfs at an elevation of 8,988.02 feet. With the top of the embankment of Dugout D-1 set at elevation 8989.0 feet, the sediment pond can pass the design event with one foot of freeboard. Thus the spillway capacity of the pond is adequate.

(See Appendix 742.221a for flow calculations, and SEDCAD 4 outputs for Pond 004A and Dugout D-1). Pond plans and details contained within this permit utilize data consistent with the 24 hour storm runoff event for Ponds 001, 002, and 003 and a 25-year, 6-hour storm event for ponds 004 and Dugout D-1.

Pond Stability Analysis

Since the slopes of Sediment Ponds 001A through 003A do not meet the criteria that the combined upstream and downstream slopes be less than 1v:5h, with neither slope steeper than 1v:2h, a stability analysis was conducted for Ponds 001A through 003A as requested by UDOGM. Chen-Northern, Inc., a geotechnical engineering consulting firm was contracted to perform stability analyses for Sediment Ponds 001A through 003A. Chen-Northern's report of their stability analysis is presented in Appendix 742.221b. A summary of the results of their analysis is presented below.

Chen-Northern used soil strength values for Sediment Pond 001A from a report by Garco Testing Laboratories dated December 2, 1988. In-place density, direct shear, soil classification and cohesion properties were determined by Garco Testing laboratories from samples taken from the embankment of Sediment Pond 001A. Soil strength values for Ponds 002A and 003A were taken from a report prepared by Rollins, Brown and Gunnell, Inc. dated November 16, 1988. Tests were conducted by Rollins, Brown and Gunnell, Inc. on soil samples taken from one test pit each excavated into the embankment of Sediment Ponds 002A and 003A. These two reports by Garco and Rollins, Brown and Gunnell, as well as the summary report completed by Chen-Northern, Inc. are presented in Appendix 742.221b.

The geometry of the embankments of the ponds were scaled from the 1-inch equals 50-foot scale mapping provided by Valley Camp. From this mapping Chen-Northern reported that the steepest upstream and downstream slopes for these ponds appeared to be 2.2h:1v upstream to 2.8h:1v downstream for Pond 001A, 1.9h:1v upstream to 1.7h:1v downstream for Pond 002A, and 1.5h:1v upstream to 1.8h:1v downstream for Pond 003A. Chen-Northern determined the safety factors for each slope of these three ponds under rapid-drawdown conditions. In their analysis they assumed the soil beneath the elevation of the principal spillway to be saturated. Their minimum calculated safety factor under rapid-drawdown conditions was 1.3 for the 1.9h:1v upstream slope of Sediment Pond 002A. Chen-Northern reported that the safety factors

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

under rapid-drawdown conditions should be greater than 1.1. Thus, the minimum safety factor computed by Chen-Northern is in excess of that required under rapid-drawdown conditions.

Chen-Northern also assessed the stability of the worst case condition, which appeared to be Sediment Pond 003A, under static and dynamic conditions. They reported the safety factors calculated for Sediment Pond 003A to be 2.0 for static and 1.6 for dynamic conditions. These safety factors correspond to the upstream slopes. They report that the safety factors for the downstream slope are slightly higher. These safety factors are greater than the required safety factors under static and dynamic conditions of 1.5 and 1.1, respectively. Chen-Northern indicates that "the safety factors obtained appear to be suitable for the purpose of the ponds."

Information related to the stability of Sediment Pond 004A is also found within Appendix 742.221b within a report prepared by Golder Associates entitled " Surface Facilities Grading Plan - Belina Mine Area". The Golder report prepared in 1980 indicates that the critical embankment failure plane is located within the lower sections of the pond embankment. The minimum factor of safety within the embankment was found to be 1.8. Also shown within the appendix following the Golder report is a copy of a computer plot of the critical cross section for Pond 004A and the associated data. The cross section and data were collected during the summer of 1990 and represent current pond conditions.

The Golder report includes a discussion related to surface facilities and grading of the Belina Mine Permit Area. Information contained within the Golder report related to these facilities is considered dated, and is superseded by hydrologic and hydraulic information presented throughout the remainder of this permit submittal. Any conflicts in information between this submittal and the Golder report should be resolved in favor of information presented within this MRP.

Information related to the stability of Dugout D-1 is found within Appendix 742.21b. This analysis was prepared by Summit Engineering. The embankment safety factor was found to be 2.8 and the rapid draw down factor of safety of 7.02.

Outlets

Preconstruction design details related to existing outlet energy dissipation structures for each of the four sediment ponds discussed above are not available. Site visits at each facility have identified the existence of small diameter rock and riprap aprons at Ponds 001A through 003A. The outlet to Pond 004A exits onto the northern edge of the embankment slope where it joins native hillside. The embankment at that point and downstream channel are heavily riprapped. An accurate determination of in place rock riprap at Ponds 001A through 003A is not possible without the excavation of a portion of each facility. Excavation at these sites would be required in order to verify the size and characteristics of in place riprap because of the presence of silt which has covered the majority of riprap placed. Only the upper tips of the in place rock and riprap is exposed. It is also noted that at some of the discharge points there are vegetative stands which not only help in stabilizing the riprap base, but also indicate the lack of discharge and erosion.

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OCT 2 6 2001
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In order to obtain an estimate of the effectiveness of the in place riprap in protecting against erosion, calculations were made using EPA, OSM, and Denver Urban Storm Drainage Criteria design methods. Riprap calculations are presented in Appendix 742.221a. In summary of the calculations, it was found that the estimated in place riprap size of 6 inches was likely adequate to protect against erosion at all pond outlets where riprap was found to be required. As confirmation that the in place riprap is likely adequate, it is remembered that Ponds 001A through 003A have never discharged, even during the high runoff periods of 1983 and 1984. All three ponds were designed to handle the 25 year, 24 hour runoff event rather than the smaller runoff event consisting of the 25 year, 6 hour storm that is now accepted as a more realistic design criteria.

It is noted that the primary and emergency spillways for Pond 004A are located so as to exit onto the heavily riprapped slope along the northern edge of the pond embankment within the flow path of the discharge channel. Riprap size requirements for the primary spillway are estimated to be on the order of 1.5 feet with a maximum diameter of 2.25 feet. Checking steep slope channel design requirements, it was found that an emergency spillway with a six foot bottom width would require average and maximum riprap sizes of 1.75 and 2.25 feet respectively at the design flow rate. Riprap sizes as large as these do not lend themselves well to the calculation of runoff velocities. In reality, the flow will be broken up by the large diameter riprap, and a substantial volume of the flow will not be carried across the surface of the rock channel, but within the available pore spaces. According to the steep channel method of design provided by OSM, the factor of safety for the designed channel as shown in Appendix 742.221a should be approximately 1.5. In place riprap appears to be doing a reasonable job of controlling discharge erosion. Outlets will continue to be monitored for integrity as required under the regulations.

The design flow rate for Filter Pond 005A is 250 gpm or approximately 0.56 cfs. According to the design methodologies employed, this small flow rate does not require riprap protection.

Summary

None of the sedimentation ponds associated with the Mine Permit Area are located within a perennial stream, and all are located immediately downstream of disturbed mine areas. Each sedimentation pond has been designed with a non-clogging dewatering device and contains sediment storage volumes in excess of the three year storage requirements.

The decants, which will be the dewatering devices for the ponds, will be manually operated. The ponds have sufficient storage capacity to totally contain the runoff volume from the 10-year, 24-hour precipitation event between the proposed decant elevations and the primary spillways as documented herein. The water level in the ponds will be maintained at or below the decant level in anticipation of a runoff producing event. The decants will also be maintained in a closed position such that during a runoff producing event (of equal or lesser magnitude to that of the design event) the runoff from the event would be totally contained by the pond. Disturbed area runoff originating from a precipitation event will be held within the pond for a period of at least 24 hours and then released in accordance with the UPDES permit for the pond.

The ponds used by the applicant have been in use for an extended period of time (except for dugout D-1) and information related to construction is not available, however, no problems

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OCT 2 6 2001

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related to short circuiting, or settlement have been noted. The embankment for Pond 004A was noted to be approximately 1.0 foot low as a result of the recent modifications which were made to the emergency spillway. The applicant makes a commitment to correct elevational discrepancies in this and like situations with spillways or embankments in response to this permit submittal during the 1990 construction period.

A thorough inspection of the sediment ponds and embankments will be done on a quarterly basis as required under Section 514.330. When examining for stability and performing a general inspection, the inspector will be looking for any of the following conditions:

* Seepage from the down stream side of the embankment.
* Erosion of embankment slopes.
* Continuity of emergency spillway.
* Erosion around entrance or exit of discharge pipe.
* Clogged principal or emergency spillway.
* A check of slope stakes for obvious slope movement (if utilized).
* Sediment level.
* Placement of wave erosion protection (if utilized).
* Erosion at spillway discharges.
* Clogging of the dewatering device.

742.222. PONDS MEETING MSHA AND 30 CFR REQUIREMENTS.

All existing ponds located on the permit area are less than 20 acre-feet and do not qualify for regulation under MSHA and 30 CFR. Should any be constructed in the future, they will be designed and constructed to safely pass the 100-year, 6-hour precipitation event.

742.223 thru 742.223.2. PONDS NOT MEETING MSHA AND 30 CFR REQUIREMENTS.

All five sedimentation ponds have combined spillways capable of carrying the 25-year, 6-hour precipitation runoff event. The designs for each pond were initially completed for the 25-year, 24-hour precipitation event in lieu of the 6-hour event. Runoff derived from a 24-hour precipitation event is higher than that for the 6-hour event. The designs as shown in the 1989 report prepared by Hansen, Allen & Luce., and as reproduced within the MRP and revision are therefore conservative.

742.230 thru 742.232. OTHER TREATMENT FACILITIES.

Other than those specified above and the ASCA's discussed within Section 750 thru 755 of this permit, no other treatment facilities exist within the Mine Permit Area.

742.240. EXEMPTIONS.

No exemptions are identified as part of this permit.

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OCT 26 2001

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742.300. DIVERSIONS.

742.310 thru 742.314. GENERAL REQUIREMENTS.

Surface runoff diversions in place within the Mine Permit Area consist of small ditches and culverts which carry water from various locations throughout the Mine Permit Area to downstream sedimentation facilities. In general, these conveyance ditches and culverts are considered convenience structures, used to aid in the conveyance of excess water thereby preventing the accumulation of water and the creation of muddy or boggy areas. By collecting and conveying the water to the sedimentation ponds in this manner, mine traffic becomes more controlled and fewer travel problems exist.

Sediment control measures utilized in ditch and diversion sections include bypass channels, Straw Pits, depressions, paved roadways or ditch sections, riprap, rock gabions, sediment traps or basins, straw bales, and vegetation. A brief description of the sediment reducing characteristics of each of these control measures was presented in Section 742.24.

As required under the regulations, all ditch and culvert sections will be removed upon mine reclamation according to the reclamation plan provided by the applicant to the Utah Division of Oil, Gas & Mining. In general, mine reclamation will proceed in two phases. Phase I will include the removal of ditches and surface water facilities located upon either the Valcam or Belina Areas, and Phase II will include the removal of the Belina Haul Road as well as the mine access road from the west. During Phase I, reclamation will generally proceed from downgradient to upgradient directions with culverts being removed as reclamation proceeds. Phase II reclamation will start at Eccles Canyon and proceed to the south with culvert removal and reclamation proceeding simultaneously. Additional details related to mine reclamation are found within the "Reclamation Plan" volume included as part of this submittal.

Runoff conveyance facilities associated with the Mine Permit Area are shown on Sediment Control Facilities Maps 731.720a through 731.720d. Map 731.720a shows those facilities associated with the Valcam Loadout Facility (including the General Office Area), Maps 731.720b and 731.720c show runoff facilities along the Belina Haul Road between Eccles Canyon and the Belina Mines, and Map 731.720d shows those associated with the Belina Mines Area. Some drainage areas for these facilities are not shown completely on the 1 inch to 100 foot scale maps upon which they have been drawn, and detailed topography for them is not available. Drainage boundaries are shown however on Drainage Basin Boundary Map 742.310a for those runoff facilities where drainages cover extensive areas not mapped in detail on the maps discussed above, such as Belina Haul Road culverts and undisturbed area bypass culverts and ditches.

MAP 742.310a. Drainage Basin Boundaries for Selected Large Watersheds

The numbering sequence used on the maps for both culverts and ditches is based upon a sequential numbering of culverts from north to south. All culverts start with a "C" designation, followed by a culvert number, thereafter followed by the culvert diameter. The culvert with the entrance farthest north carries therefore a designation of "C-1-diameter". The numbering sequence is consistent throughout the Valcam and Belina Permit Areas. The lowest culvert and

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OCT 26 2001

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OCT 26 2001

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ditch numbers occur at the far north end of the Valcam Permit Area and increase in a southern direction until the highest number is reached at the southern most end of the Belina Permit Area. Ditch numbering is tied directly to the culvert associated with the ditch, or if no culvert exists, with the closest culvert. All disturbed area ditch sections carry a "D" designation, followed by a ditch number (which is tied to the closest culvert). In the event that two or more ditches are associated with any given culvert, the ditch number would be followed by a letter of the alphabet, indicating multiple ditch sections. For example, the five ditches associated with Culvert C-12-24 shown on Sediment Control Facilities Map 731.720a, are numbered D-12A through D-12E. Undisturbed area bypass ditches (one of which is located at the Valcam Loadout Facility, and four at the Belina Mine Site) are numbered UDD-1 through UDD-5. Undisturbed area bypass ditches located at Belina Mine site will be removed during the surface coal mining process (UDD-2 through UDD-5). The water from the undisturbed area will pass through sediment structure pond 004A or dugout D-1.

The design methodology used in estimating the peak flows for all diversion facilities is presented in Section 742.220 of the MRP. The 10-year, 6-hour precipitation event (1.55 inches) was used for runoff design as obtained from Richardson (1971). The areas contributing runoff to each drainage system were subdivided in accordance with cover complex; i.e. paved area, disturbed area, sage/grass area, and forest/aspen area. A curve number of 98 was assumed for paved areas, a curve number of 90 was assumed for disturbed areas, a curve number of 75 was assumed for sage/grass areas, a curve number of 70 was assumed for low density forest/aspen areas, and a curve number of 40 was assumed for high density forest/aspen areas. A summary of curve numbers and hydrologic soil groupings are shown in the sediment pond analyses and calculations presented in Appendix 742.221a. Volume weighted curve numbers were determined to represent composite areas. Two additional culverts were designed for the surface mining phase at White Oak Complex. C# 1005 replaces culvert C-30-24 and C# 1006 is a new culvert.

DISTURBED AREA DITCHES

A field reconnaissance of surface runoff characteristics of the Mine Permit Area was conducted by Hansen, Allen & Luce engineers in the spring of 1989. As part of their field investigation, data was collected related to ditch and culvert characteristics within the Mine Permit Area. Main ditch and culvert sections were identified at that time which were considered to be of major importance to the conveyance of disturbed area runoff. Data summaries showing the characteristics of these ditch and culvert sections are shown on Tables 742.310a and 742.310b respectively.

Because many of the ditch and culvert sections are dependent upon runoff flows from adjacent areas, the culvert and ditch analyses completed for this permit submittal include all those facilities located within the Mine Permit Area. However, only those considered to be of major importance to the runoff characteristics of the area are included within the tables referenced in this section of the permit. Generally speaking, those ditches not listed in the tables referenced are classified by the operator as "Convenience" ditches and are installed using a generic triangular ditch design with a depth of between one half to one foot. In order to demonstrate that these ditches will meet minimum design criteria, the calculations shown in Appendix 742.310 have been modified to include depth and velocity. Ditch sections along the Belina Haul Road are concrete lined thereby controlling erosion, and therefore are likewise not included in the design tables. However, design calculations have been generated as part of the MRP order to determine the relative magnitude of flow anticipated in each concrete lined ditch section. Maps 731.720a through 731.720d show the layouts of each ditch and culvert section within the Mine Permit Area. Calculations for both ditches and culverts are presented in Appendix 742.310. Four new ditches were designed for the surface mining at White Oak. These ditches were designed using rational method shown in Appendix 742.310. These are ditches #1001, #1002, #1003 and #1004. Ditch #1001 is new and Ditch #1002 replaces D-29A, Ditch #1003 replaces D-30, and Ditch #004 replaces D-33A.

TABLE 742.310a
DITCH FLOW CHARACTERISTICS

DITCH NO.	RUNOFF AREA (AC)	WEIGHTED CN	PEAK FLOW (CFS)	MANNINGS N	SLOPE		SIDE SLOPE (1:M)	BOTTOM WIDTH (FT)	FLOW DEPTH (FT)	MAXIMUM VELOCITY (FPS)	RIPRAP D50 (FT)
					MAX (FT/FT)	MIN (FT/FT)					
D-1	8.2	85.9	3.9	.03	.03	.05	2	1	0.5	4.7	N/A
D-3	5.6	85.5	2.6	.03	.015	.10	2	0	0.7	2.7	N/A
D-5B	2.8	91.5	2.2	.03	.03	.11	2	0	0.3	4.8	N/A
D-7A	0.8	90.0	0.6	.03	.02	.08	2	0	0.9	3.5	N/A
D-7B	1.6	91.9	1.3	.03	.045	.11	2	1	0.3	4.5	N/A
D-12D	1.6	93.0	1.4	.03	.02	.02	2	0	0.5	2.6	N/A
D-13A	2.1	80.1	0.6	.03	.03	.18	2	0	0.4	4.8	N/A
D-13B	2.2	80.7	0.7	.03	.15	.35	2,15	2	0.2	4.6	N/A
D-16B	0.7	90.0	0.5	.03	.01	.10	2	0	0.4	3.7	N/A
D-30	2.3	82.8	4.5	-	.10	.13	Concrete Ditch Installed at Roadside				
D-33A	14.3	83.4	5.4	-	.04	.04	Concrete Ditch Installed at Roadside				
D-33B	13.4	86.0	6.6	.03	.04	.04	2,15	0	0.5	3.7	N/A
D-34A	1.3	85.0	0.6	.03	.02	.02	2	0	0.4	2.2	N/A
D-34B	3.0	88.2	1.9	.03	.02	.05	2	0	0.6	4.1	N/A
D-35	4.6	89.3	3.0	.03	.02	.02	2	0	0.7	3.2	N/A
D-37*	1.4	90.0	1.0	.03	.18	.18	2,15	0	0.2	4.0	N/A
	3.8	90.0	2.6	.03	.02	.10	2,15	0	0.8	4.1	N/A
	3.8	90.0	2.6	.04	.30	.30	2	2	0.2	5.9	0.75
D-44A	1.5	80.0	0.4	.03	.10	.10	2	0	0.3	3.6	N/A
D-44B	1.8	77.8	0.4	.03	.17	.21	2	0	0.2	4.5	N/A

Ditch No.	Runoff Area (A)	Runoff Coff. (C)	Rainfall Intensity (I)	Peak Flow (Q) cfs	Mannings (N)	Slope (%)	Side Slope (M:1)	Top Width (FT)	Bottom Width (FT)	Flow Depth (FT)	Maximum Velocity (FPS)	Riprap D50 (FT)
D-1001	116.14	1	2.4	278.74	0.043	3	1.5	13.53	0	4.51	9.15	.75
D-1002	7.59	1	2.4	18.22	0.042	8	2	4.72	0	1.18	6.55	.5
D-1003	8.48	1	2.4	20.35	0.047	11	2	4.83	0	1.21	6.97	.5
D-1004	9.27	1	2.4	22.25	0.036	3	2	5.77	0	1.44	5.35	.25

* Values are for Upper, Middle and Lower sections respectively.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

UNDISTURBED AREA BY-PASS DITCHES

Hansen, et. al. (1989) provided a hydrologic analysis of the undisturbed area by-pass channels and culverts within the Belina and Valcam Permit Areas. This hydrologic analysis included an estimate of the peak flowrate from the 6-hour precipitation event. There are two undisturbed area by-pass culverts (C-4-42 and C-14-42) and five open channels (UDD-1 through UDD-5, Note: UDD-2 through UDD-5 to be removed when surface coal removal mined through them) for which peak flows from the above referenced design events were estimated. The design check of bypass culverts was completed using the 100-year, 6-hour precipitation event, and the 10-year, 6-hour precipitation was used for the design check of undisturbed area drainage ditches. It is important to note that some renumbering of culverts was implemented in response to the MRP, and therefore caution is advised when comparing data shown herein with previous documentation. For example, the culvert listed as C-12-42 in the 1989 Hansen, et. al. report has been renamed C-14-42. Calculations for both undisturbed area bypass ditches and culverts are presented in Appendix 742.310.

TABLE 742.310b
CULVERT FLOW CHARACTERISTICS

CULVERT NO.	RUNOFF AREA (AC.)	WEIGHTED CN	PIPE DIA. (IN.)	PIPE SLOPE (FT/FT)	AVAILABLE HW/D RATIO	INLET CAPACITY (CFS)	PIPE CAPACITY (CFS)	DESIGN FLOW RATE (CFS)	COMMENT
C-1-32	8.2	85.9	32	.25	1.9	45.0	132.0	3.9	Flow from D-1
C-4-42	88.0	61.7	42	.03	1.9	90.0	94.4	4.0	Flow from Undisturbed Area
C-5-18	3.4	-	18	.03	1.5	9.0	16.9	2.6	Flow from D-5A,B
C-6-18	4.5	-	18	.025	2.7	13.0	9.0	3.4	Flow from D-6,C-5-18
C-7-24	2.4	-	24	.05	1.4	16.5	27.4	1.8	Flow from D-7A,B
C-8-18	1.6	-	18	.04	1.5	9.0	11.4	1.2	Flow from D-8,D-9A,B
C-10-18	12.8	75	18	.10	1.5	9.0	18.0	1.2	Flow from D-10
C-11-12	0.8	91.3	12	.08	1.0	2.0	5.5	0.6	Flow from Tributary Area
C-12-24	1.1	-	24	.02	2.0	22.0	17.3	0.9	Flow from D-12A,B
C-14-42	242.0	67.5	42	.03	1.9	90.0	94.4	21.9	Flow from Undisturbed Area
C-15-24	4.2	82.8	24	.05	1.6	18.5	27.4	1.6	Flow from D-15
C-19-48	1482.0	74.3	48	.06	2.1	130.0	190.6	77.0	Flow from Undisturbed Area
C-21-48	2072.0	73.0	48	.01	8.3	215.0	276.0	92.6	Flow from Tributary Area
C-22-24	22.0	70.5	24	.057	1.4	17.0	29.3	0.8	Flow from Tributary Area
C-23-24	22.0	70.5	24	.08	1.8	20.0	34.7	0.8	Flow from Tributary Area
C-24-24	20.0	75.0	24	.12	2.1	22.0	42.5	2.0	Flow from Tributary Area
C-25-36	151.0	72.7	36	.12	7.3	130.0	125.2	7.0	Flow from Tributary Area
C-26-24	14.0	75.0	24	.18	2.0	22.0	52.0	1.5	Flow from Tributary Area
C-27-24	14.7	71.0	24	.43	2.3	24.0	80.6	0.6	Flow from UDD-2
C-28-24	35.0	74.8	24	.30	4.3	35.0	67.1	3.3	Flow from UDD-2,Tributary Area

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

CULVERT NO.	RUNOFF AREA (AC.)	WEIGHTED CN	PIPE DIA. (IN.)	PIPE SLOPE (FT/FT)	AVAILABLE HW/D RATIO	INLET CAPACITY (CFS)	PIPE CAPACITY (CFS)	DESIGN FLOW RATE (CFS)	COMMENT
C-30-24	12.3	82.8	24	.04	2.0	21.0	24.5	4.5	Flow from D-30
C-32-36	5.9	73.8	36	.04	2.6	80.0	72.3	0.6	Flow from D-32A,B
C-33-24	27.7	-	24	.17	2.0	22.0	50.5	12.0	Flow from D-33A,B
C-34-24	4.3	-	24	.30	2.2	22.0	67.2	2.5	Flow from D-34A,B
C-36-12	4.9	-	12	.30	2.2	4.0	10.6	1.1	Flow from D-36,C-38-6
C-38-6	2.2	76.1	6	.07	3.0	1.3	0.8	0.4	Flow from Tributary Area
C-39-8	1.8	70.0	8	.08	2.8	2.0	1.9	0.1	Flow from D-39A,B
C-40-42	54.9	70.0	42	.30	4.3	140.0	265.3	5.3	Flow from C-41-12,C-44-24, and Tributary Area
C-41-12	-	-	12	.17	2.4	4.5	8.0	1.0	Flow from Mine Discharge
C-44-24	74.2	70.0	24	.08	3.2	29.0	34.7	2.5	Flow from Undisturbed Area

Culverts #1005 and #1006 were sized using the flows of Ditch #1003 and Ditch #1004 respectively incorporated into a SEDCAD run and the results are included in Appendix 742.310.

Undisturbed area bypass channel UDD-1 is associated with the Valcam Loadout Facility, and bypass channels UDD-2 through UDD-5 (to be removed) are associated with the Belina Mine Site. The locations and tributary areas of these culverts and channels are shown on Maps 731.720a through 731.720d, and on Map 742.310a.

Summary data for tributary areas to the undisturbed area by-pass channels are presented in Table 742.310c. Peak flow projections from the precipitation events referenced above along with the respective watershed characteristics are presented in Table 742.310d. Calculations and computer printouts of the hydrographs from the analysis, as well as hydraulic channel designs for culverts and ditches UDD-1 through UDD-5 are shown in Appendix 742.310.

Two intermittent streams have been diverted within the Mine Permit Area, both of which have been in place for many years. Both intermittent streams are located within the Valcam Permit Area and are culverted. These culverted streams are identified as culverts C-4-42 and C-12-42 on Map 731.720a. A stream diversion located within Whisky Creek (identified as culvert C-40-42 on Map 731.720d) is also a culverted section which lies beneath the coal loadout pad of the Belina Permit Area. At one time UDOGM desired to classify Whisky Creek as a perennial stream due to continued mine discharges, however, no discharges have occurred for some time and therefore Whisky Creek should rightly be classified as an ephemeral stream.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

TABLE 742.310c
TRIBUTARY AREA TO UNDISTURBED AREA BY-PASS CHANNELS

CHANNEL	FORESTED/ASPEN AREA ACRES	SAGE/GRASS AREA ACRES	TOTAL AREA ACRES
UDD-1	0.0	6.7	6.7
UDD-2	13.3	1.4	14.7
UDD-3	0.0	8.1	8.1
UDD-4	5.5	0.0	5.5
UDD-5	7.2	0.0	7.2

TABLE 742.310d
UNDISTURBED AREA WATERSHED CHARACTERISTICS AND PEAK FLOW

CHANNEL	AREA ACRES	VOLUME WEIGHTED CURVE NUMBER	HYDRAULIC LENGTH FT	WATERSHED SLOPE %	10-YR, 6-HR PEAK FLOW CFS
UDD-1	6.7	75	700	27	0.84
UDD-2	14.7	71	1900	37	0.57
UDD-3	8.1	75	1500	32	0.85
UDD-4	5.5	70	1250	31	0.19
UDD-5	7.2	70	1100	28	0.25

742.320 thru 742.324. DIVERSION OF PERENNIAL AND INTERMITTENT STREAMS.

The hydraulics (including inlet and pipe flow conditions) for all three culverts have been checked against the 100-year, 6-hour precipitation runoff event. Calculations and data summaries for these three culverts are presented with the remainder of Mine Permit Area culverts in Section 742.310.

742.330 thru 742.333. DIVERSION OF MISCELLANEOUS FLOWS.

All flow diversions within the Mine Permit Area are discussed in Section 742.310. Additional clarification however is warranted regarding diversion ditch D-1 located at the

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

Valcam Loadout Facility. This ditch collects water from the disturbed area within the northwestern portion of the permit area. A careful review of Map 731.720a will show that some of the upgradient undisturbed area drainage is diverted to the north around the collection area for the ditch. Topographic mapping and field verification indicate that a small roadway exists which effectively diverts upgradient runoff waters around the permit area. The roadway is owned and operated by Utah Power and Light Company and is used for power pole maintenance purposes. Because the applicant has no control over the diversion, no data, design or details are provided herein.

742.400 thru 742.423.5. ROAD DRAINAGE.

Roads located within the Mine Permit Area have been in place for a number of years, and no new roads are contemplated at this time. All existing roads are constructed with side slopes to facilitate surface drainage. In the future, should any new roads be required, UDOGM will be notified, and all roads will be constructed in such a manner so as to provide for proper drainage. Road drainage will be accomplished by 1) sloping the road surface towards the inner embankment and 2) constructing an accompanying drainage ditch paralleling the roadway when required to prevent excessive erosion, or to prevent spillage into another runoff drainage basin. After collecting surface runoff, the drainage ditch system diverts surface runoff to a downstream channel or sedimentation pond. When runoff is derived from undisturbed surface areas, the road drainage system redirects surface flows to natural channels. When runoff is derived from disturbed surface areas, the runoff is diverted through a sedimentation pond.

All roads have been constructed on the most stable available surfaces and no stream fords are used throughout the Mine Permit Area. Runoff calculations for culverts located beneath roadways are based upon the 10-year, 6-hour runoff event according to the SCS runoff prediction methodology presented earlier in this permit. Some concrete drop boxes and grated inlets have been installed at selected road culverts to aid in the protection against culvert plugging from runoff debris. For the most part, these grated inlets are located at undisturbed area bypass culverts, at the inlet of major culverts lying at the base of mine highwalls, and along the Belina Haul Road connecting Eccles Canyon with the Belina Mines.

Roadside or mine yard culverts identified as having grated inlets at the time of this submittal include C-23-24, C-24-24, C-26-24, C-26A-24, C-32-36, and C-33-24. Other undisturbed area bypass culverts for which grated inlets have been installed include C-4-42, C-14-42, and C-40-42. The locations of these grated inlets are shown on Maps 731.720a thru 731.720d. Small culverts found within the disturbed Mine Permit Area are generally not provided with grated inlets or inlet/outlet headwalls. These devices are not provided because should a failure occur, all runoff would be recollected within a downstream culvert and or ditch section, and carried to the appropriate sedimentation pond for water quality control. Repairs to, or replacements of damaged culverts will be completed by the applicant as required for efficient mine operation, and for the protection of the hydrologic balance.

743 thru 743.300. IMPOUNDMENTS.

The requirements of this section are discussed and met in Section 742.220 within the discussion on sedimentation ponds.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

744 thru 744.200. DISCHARGE STRUCTURES.

Information related to discharge structures for sedimentation ponds and diversions located within the Mine Permit Area is found in Sections 742.220 and 742.300 respectively. Erosion control calculations for these discharge structures are found for each respective structure or diversion within Appendix 742.310. As the calculations indicate, the great majority of structures require little or no additional protection beyond that found to naturally exist. In some instances calculations indicate that some protection is suggested, however, current conditions show that little erosion is occurring. Under these conditions, erosion protection will not be installed unless it is shown that active erosion is occurring at an unacceptable rate and that the erosion is degrading downstream water quality. With these considerations it is found that only a select few discharge structures require erosion protection.

745 thru 745.400. DISPOSAL OF EXCESS SPOIL.

All spoil generated during the surface mining at White Oak Complex is planned for placement on preexisting benches and pits developed within the Mine Permit Area.

746. COAL MINE WASTE.

746.100 thru 746.120. GENERAL REQUIREMENTS.

Information related to coal mine wastes is given in Section 528.300 of the permit.

746.200 thru 746.222. REFUSE PILES.

No permanent impoundments are planned for placement on completed refuse piles.

746.300 thru 746.340. IMPOUNDING STRUCTURES.

No new or existing impoundments are or will be constructed of coal mine waste unless they meet the requirements of this section.

746.400 thru 746.430. RETURN OF COAL PROCESSING WASTES TO ABANDONED UNDERGROUND WORKINGS.

No coal processing wastes are generated by the applicant in its operation. The only material which has been disposed of within the mine which could be classified as waste consisted of sediment which was removed from Pond 004A with the approval of UDOGM and MSHA. The sediment disposal site for Pond 004A within the mine is located in the West mains near First and Second South. Should coal mine wastes be identified in the future, and it be desired to return them to the underground workings, then the requirements of this section will be met in consultation with UDOGM.

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

747 thru 747.300. DISPOSAL OF NON-COAL MINE WASTES.

Information related to the disposal on non-coal mine wastes is presented within Section 528.330 of this permit.

748. CASING AND SEALING OF WELLS.

All water wells currently used within the Mine Permit Area have been cased as required, and those wells abandoned have been sealed as discussed in Section 631 according to the requirements of this section to:

1. Prevent acid or other toxic drainage from entering the ground or surface water.

2. Minimize the disturbance to the hydrologic balance of the Mine Permit Area.

3. Ensure the safety of people, livestock, fish and wildlife, and machinery.

Wells exposed by coal mining and reclamation operations, or other exploratory, monitoring and water wells will be permanently sealed unless otherwise approved by UDOGM as outlined in Section 731.400.

750 thru 755. PERFORMANCE STANDARDS.

All performance standards required within this section of the regulations with the exception of Alternate Sediment Control Alternatives (ASCA's) have been previously discussed within other sections of the MRP. A discussion of the ASCA's used within the permit area is provided later in this section. All discharges from the mines or disturbed mine areas are governed under UPDES discharge permit number UT-0022985 (included in Appendix 750 and discussed in Section 731.221), and efforts are being made to comply with all Utah and federal water quality laws. Efforts include the installation and maintenance of numerous runoff control ditches and culverts, the maintenance of four sedimentation ponds, the installation of numerous silt traps and silt fences, and the revegetation of disturbed areas. All disturbed areas will be reclaimed upon mine abandonment. Hydrologic reclamation details are included within the "Reclamation Plan" volume included as part of this submittal.

The effectiveness of in place erosion control devices and practices will be based upon the "Erosion Condition Classification System - Technical Note - Method for Evaluation of Erosion of Reclaimed Coal Lands in Western United States" (Office of Surface Mining, 1990) or another definable method agreed upon by both the Division and Valley Camp of Utah, Inc.

All mine road drainage is controlled through the collection and treatment of disturbed area runoff in local sedimentation ponds with the exception of the Belina Haul Road between Eccles Canyon and the Belina Mines. A concrete ditch system has been installed alongside the paved coal haul road up Whisky Creek which helps prevent the erosion of the downslope hillside and or road base, and allows for the diversion and bypass of natural waters without excessive impact. Erosion is reduced throughout the mine facility through regular grading and maintaining of the

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

road system. Where possible, the applicant will continue to revegetate disturbed areas impacted during the operational phase of mining as soon as practical after the disturbance ceases. Revegetation efforts on disturbed area hillsides (at the Belina mine for example) have been very successful.

Other areas of concern raised through the regulations is the disposal of excess spoil, coal mine waste, and non-coal mine waste. These issues are likewise discussed earlier within Sections 745 and 746.

Casing and sealing of wells will be managed to comply with Sections 738, 748 and 765.

A total of six Alternative Sediment Control Structure areas (ASCA's) are identified within the Total Permit Area for which exclusion from further permitting is being requested. Two of these ASCA's (ASCA 1 and 2) are associated with the Valcam Loadout Facility, one (ASCA 3) is associated with the General Office Area west of the Valcam Loadout Facility, and three (ASCA 4 through ASCA 6) are associated with the Belina Mines. The locations of ASCA 1 through ASCA 3 are presented on Map 731.720a, and ASCA 4 through ASCA 6 are presented on Map 731.720d.

The three general qualifying criteria that must be met in order for an area to qualify as a ASCA are:

1. The area cannot be tributary to a sediment pond.
2. The area must have some form of a treatment structure to treat runoff from the area.
3. The summation of the areas of the ASCA's must be less than fifteen percent of the total disturbed area.

Runoff from the ASCA's is not tributary to any of the sediment ponds and several alternative sediment treatment structures are already in place. A commitment by the applicant to complete those not yet in place prior to final approval of this mine re-permit has been made. Table 750a is inserted to provide a breakdown of areas included within each ASCA. Table 750b provides a breakdown of total tributary area which impacts each ASCA. The total disturbed tributary areas (not including Forested/Aspen and Sage/Grass areas) to Sediment Ponds 001A through 004A is 41.43 acres, and as shown in the referenced tables the total tributary area to all ASCA'S is 6.7 acres. Thus, the total area of the proposed ASCA's is approximately 13.9 percent of the total disturbed area of the mines, meeting criteria No. 3 presented above. Maps 731.720a through 731.720d show the locations of sediment control facilities, and ASCA's found within the Mine Permit Area.

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

TABLE 750a
ASCA AREA BREAKDOWNS

ASCA No.	PAVED AREA (ac-ft)	DISTURBED AREA (ac-ft)	SAGE/GRASS AREA (ac-ft)	FOREST/ASPEN AREA (ac-ft)	TOTAL AREA (ac-ft)
1	-	1.13	-	-	1.13
2	0.11	1.00	-	-	1.11
3	0.75	0.87	-	0.5	2.12
4	-	0.19	-	-	0.19
5	-	1.16	-	-	1.16
6	-	0.95	-	-	0.95

Runoff volumes from the 10-year, 24-hour precipitation event were determined for 1) ASCA areas, and 2) that area specific to ASCA areas including adjacent tributary areas. Calculated volumes of runoff derived from the 10 year, 24 hour precipitation event for both ASCA areas as well as ASCA plus adjacent tributary areas are shown in Table 750c. A comparison of the total runoff volume from the ASCA's themselves (0.83 acre-feet) versus the runoff volume from the 10 year, 24 hour precipitation event to the sediment ponds (5.92 acre-feet) indicates that the runoff volume from the ASCA's is approximately 14 percent of the runoff volume controlled by the sediment ponds. Calculations are shown in Appendix 742.221a.

TABLE 750b
TOTAL ASCA PLUS TRIBUTARY AREA BREAKDOWNS

ASCA NO.	PAVED AREA (ac-ft)	DISTURBED AREA (ac-ft)	SAGE/GRASS AREA (ac-ft)	FOREST/ASPEN AREA (ac-ft)	TOTAL AREA (ac-ft)
1	-	1.13	-	-	1.13
2	0.60	1.00	-	-	1.60
3	0.75	0.87	-	0.50	2.12
4	-	0.19	-	0.37	0.56
5	-	1.16	-	-	1.16
6	-	0.95	1.00	1.34	3.29

INCORPORATED

OCT 26 2001

DIV OF OIL GAS & MINING

TABLE 750c
10 YEAR, 24 HOUR RUNOFF VOLUMES FROM ASCA'S AND FROM ASCA'S PLUS TRIBUTARY AREAS

ASCA NO.	10 YEAR, 24 HOUR RUNOFF VOLUME FROM ASCA AREAS ONLY (AC-FT)	10 YEAR, 24 HOUR RUNOFF VOLUME FROM ASCA PLUS TRIBUTARY AREAS (AC-FT)
1	0.14	0.14
2	0.14	0.23
3	0.27	0.27
4	0.02	0.03
5	0.14	0.14
6	0.12	0.22
Total	0.83	1.03

Five undisturbed area bypass channels have been designed for the Mine Permit Area as shown on the maps referenced. These ditches aid in the control of sediment transport by preventing runoff from undisturbed areas from crossing over disturbed drainages where higher sediment transport rates are possible.

Straw pits as they are termed herein consist of small holes dug along side a mine road after which they are filled with straw. These holes (approximately 2 feet by 3 feet in horizontal dimension) serve as small retention basins which help control the amount of sediment moving within and out of an ASCA.

Small depressions located at some points within the Mine Permit Area collect and retain surface runoff from small disturbed drainage areas. These depressions help collect and retain moving sediment, as well as reduce total runoff thereby reducing erosion.

Where practical, natural vegetation is allowed to grow into runoff conveyance facilities in order to reduce overall erosion rates. Vegetative stands and the associated root network aid in holding soil in place thereby reducing sediment transport. An example of this type of erosion prevention is found in the ditch sections near the General Office Area within the Valcam Permit Area.

Paved roadways also aid in reducing erosion within the Mine Permit Area. They also aid in reducing the amount of air pollution through dust and particulate matter caused by motor

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

vehicles. Concrete ditch sections located along the Belina Haul Road to the Belina Mines, and along selected road sections at the mine itself act in the same manner as paved roadways and reduce erosion.

Revegetation of disturbed areas and ditch sections reduce erosion rates by re-establishing vegetative growth. The additional water holding and water retention capacity of vegetated areas acts in conjunction with root zones to reduce soil movement.

The great majority of surface runoff conveyance facilities within the Mine Permit Area have been in place for an extended period of time. The amount of erosion evident at each of the facilities is therefor indicative of the type and amount of erosion that is anticipated to occur as a result of runoff characteristics. In some locations, the placement of riprap has been a successful deterrent to continued erosion.

Rock gabions have been placed within some small channel sections to prevent upstream erosion. In cases where erosion would normally exist, this type of control prevents undercutting and forces the water to back up behind the gabion until water can flow over the top of the structure. When this happens, the slope and runoff velocity of the channel remains constant thereby maintaining controlled sediment load rates. An example of ditch sections using rock gabions successfully can be seen in the ditches located at the entrance to the Valcam Loadout Area.

Sediment basins (or traps) are located at selected sites within the Mine Permit Area to reduce the amount of sediment being carried to downstream locations. These basins reduce local ditch runoff velocities thereby allowing the larger sediment to be dropped out.

Straw bales placed within the ditch section act as small filter dams which have two effects. First, they create a damming effect which reduces flow velocity (thereby reducing sediment loadings), and second, they filter out larger sediment particles. These straw bales are placed perpendicular to the ditch channel, and are kept in place through the use of steel rebar or other similar device which is driven through the bale and anchored securely into the ground.

Silt fencing is placed at the bottom of some disturbed hillslopes to help capture the small amount of sediment which may be moving on site. Typically these silt fences help control sediment while allowing the passage of runoff.

Each of the sediment control measures outlined above were considered for use at each of the ASCA's located within the Mine Permit Area. Table 750d provides a summary of the proposed treatment facilities for each ASCA.

INCORPORATED

OCT 2 6 2001

DIV OF OIL GAS & MINING

TABLE 750d
PROPOSED ASCA TREATMENT FACILITIES

FACILITY	ASCA 1	ASCA 2	ASCA 3	ASCA 4	ASCA 5	ASCA 6
Bypass Channel	X	X	-	-	X	X
Straw Pits	-	X	-	X	-	X
Depressions	-	X	-	-	-	X
Nat. Vegetation	X	X	X	X	X	X
Paved	-	X	X	-	-	-
Revegetation	-	-	X	-	X	X
Riprap	X	X	-	-	X	X
Rock Gabion	-	X	-	-	-	-
Sediment Basin	X	X	-	X	X	X
Straw Bale(s)	-	X	X	X	X	X
Silt Fencing	X	-	-	-	-	-
Total Acres	1.1	0.4	2.3	1.0	0.2	0.8

Because of the continued variability of mining operations it is not possible to locate on a map the exact location of each of the sediment control alternatives outlined within the previous table. However, general guides as to their use and their location is provided in Table 750e. Note in the table that only those sediment control devices which are currently used for a particular ASCA are noted.

TABLE 750e
GENERAL APPLICATION OF SEDIMENT CONTROL FACILITIES

DEVICE	LOCATION OF DEVICE
ASCA 1	
Bypass Channel	Consists of Ditch D-6
Natural Vegetation	Filling in on Slopes
Riprap	Located at outlet to C-4-42
Sediment Basin	Diversion ditches route water to Ponds 001A and 002A
Silt Fence	Located at toe of slope midway between Pond 001A and 002A

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ASCA 2	
Bypass Channel	Consists of Ditches D-8, D-12E and D-16B
Depression	One located at the outlet to C-12-24, one midway down D-12D, and one near the end of D-12D.
Natural Vegetation	Filling in on Slopes
Paved Roadway	Part of Access Roadway to Loadout Facility
Riprap	Located at outlet to D-12D and along Creek
Rock Gabion	Located at bottom of Ditches D-12A and D-12C
Sediment Basin	Diversion ditches route water to Ponds 002A and 003A
Straw Bales	Straw bales located at downstream end of Ditches D-12A,B & C
ASCA 3	
Natural Vegetation	Filling in from surrounding area
Paved Roadway	Access roadway to office facilities
Revegetation	Grass in front of office
Straw Bales	Located at end of Ditch D-19B
ASCA 4	
Straw Pits	Located along Ditch UDD-2
Natural Vegetation	Filling in on Slopes
Sediment Basin	Located at end of Ditch UDD-2
Straw Bales	Located at sediment basin outlet
ASCA 5	
Bypass Channel	Consists of Ditches UDD-4 and D-34A
Natural Vegetation	Filling in on Slopes
Revegetation	Entire slope
Riprap	Located at sediment basin outlet
Sediment Basin	Located at far northeast corner of area
Straw Bales	Located at sediment basin outlet
ASCA 6	
Bypass Channel	Consists of Ditch UDD-3
Straw Pits	Located along Ditch D-44A and D-44B
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Natural Vegetation	Filling in on Slopes
Revegetation	Topsoil stockpile, Lower UDD-3, & slope above substation
Riprap	Located at outlet to UDD-3
Sediment Basin	Located at end of Ditch D-44A
Straw Bales	Located around topsoil pile and at end of Ditches D-44A & B

UDOGM has requested that the applicant prepare a monitoring plan which samples collectable drainage for water quality from each ASCA when practical. As a minimum, each sample is proposed by the regulating agency to be analyzed for total suspended and settleable solids. Local conditions make it difficult to collect and monitor runoff from ASCA areas within the permit area because of 1) variability in climatic conditions during early spring, late fall and winter, 2) the amount of runoff noted or expected from the ASCA's (if any) is relatively small, 3) the collection of a water quality sample under low flow conditions will likely be invalidated due to the unavoidable collection of bottom sediments resulting in the distortion of the analytical results, and 4) the ability to collect samples from each ASCA prior to the end of a measurable runoff event developed from typical mountain storms is limited. It is the applicants posture that the collection of TDS and TSS samples from ASCA's is not possible nor practical and therefore no additional sampling is planned.

760. RECLAMATION.

Reclamation details are provided with the reclamation section of the MRP.

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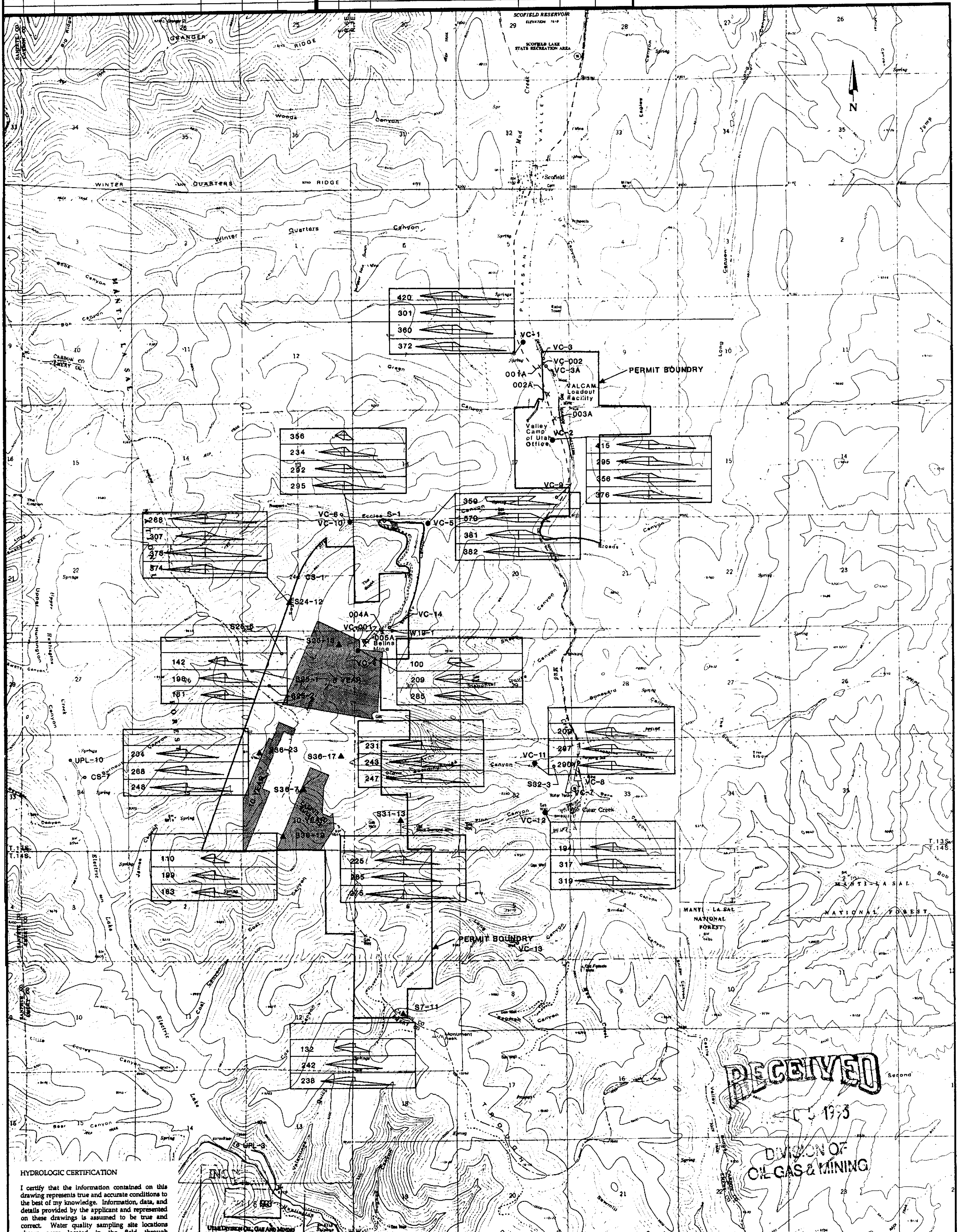
VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM			VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS	NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



HYDROLOGIC CERTIFICATION

I certify that the information contained on this drawing represents true and accurate conditions to the best of my knowledge. Information, data, and details provided by the applicant and represented on these drawings is assumed to be true and correct. Water quality sampling site locations shown were located in the field through triangulation, and were not surveyed.

LEGEND:

- X NPDES DISCHARGE LOCATION
- ▲ SPRING SAMPLING STATION
- ● SURFACE WATER SAMPLING STATION
- ○ ABANDONED SAMPLING LOCATION
- PROJECTED AREA AND TIMING OF FUTURE MINING

Na⁺ Ca Mg — 319 — C SO4 HCO3

6 4 2 0 2 4 6

Me/l

BOX SHOWN IDENTIFIES SEASONAL WATER QUALITY AS SHOWN BELOW

1st	QUARTER WATER QUALITY
2nd	QUARTER WATER QUALITY
3rd	QUARTER WATER QUALITY
4th	QUARTER WATER QUALITY

NOTES:
1. ANION-CATION DIAGRAM REPRESENTS DATA THROUGH MAY 1989. NUMBER TO LEFT OF ANION-CATION DIAGRAM IS AVERAGE QUARTERLY TDS AS UPDATED THROUGH APRIL, 1990.
2. SPRING 36-7 SAMPLING STARTED 9/92 AT THE REQUEST OF DOGM.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID E. HANSEN 10/4/90 STATE OF UTAH

VALLEY CAMP OF UTAH, INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

TITLE: MAP R645-301-722.100a GROUND AND SURFACE WATER SAMPLING LOCATIONS WITH SEASONAL WATER QUALITY

Drawn by: DEH		Date: 7/89	
Approval: DEH		Date: 9/90	
Drawing No.		Rev. 1 3/93	

HANSEN ALLEN & LUCE INC Salt Lake City Utah

SCALE: 1" = 2000'

SHEET 1 OF 1

007.11.100.011

VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

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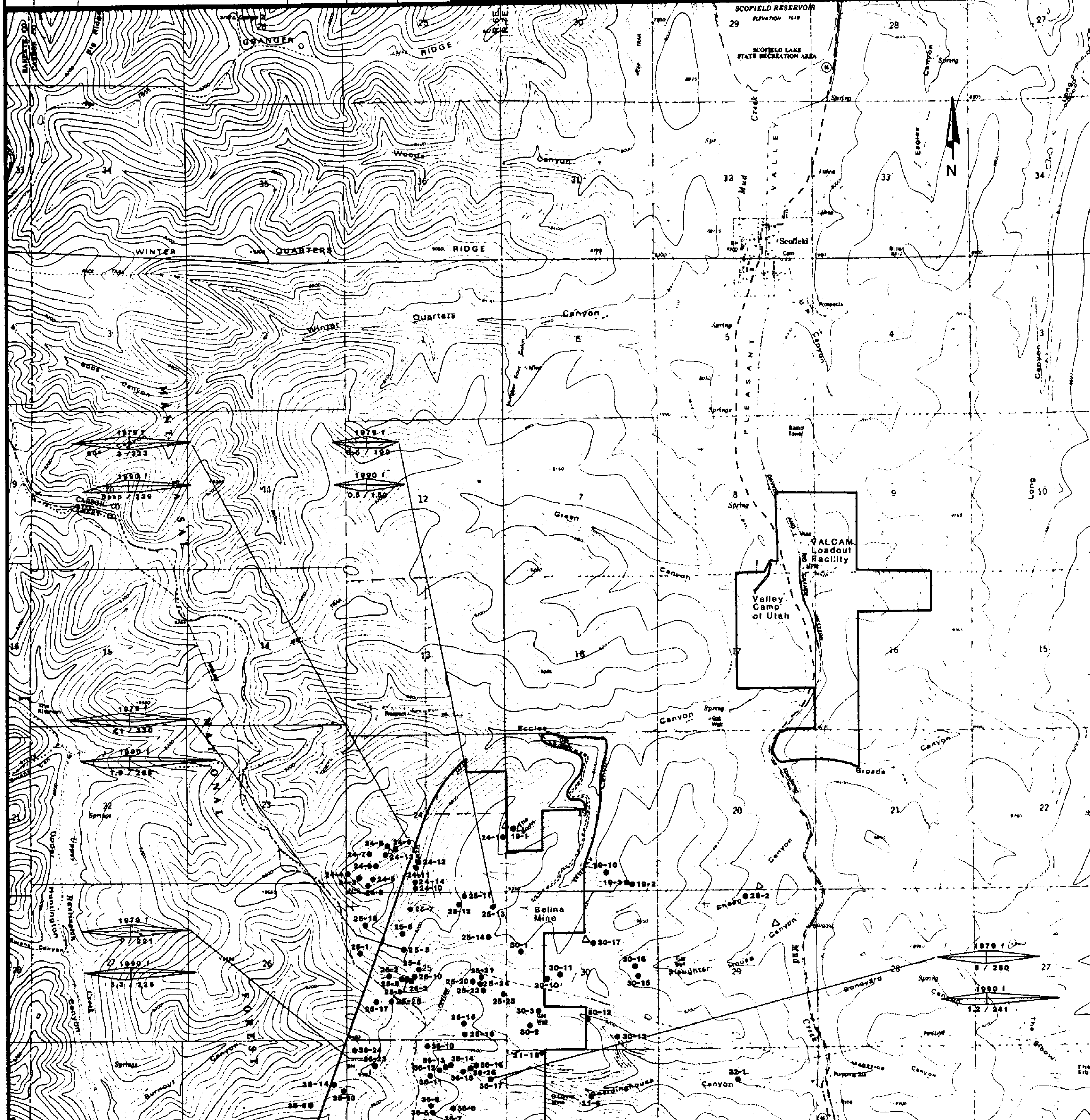

SEEP AND SPRING FIELD DATA

Spring No.	Date	Flow (gpm)	Temperature (°C) Air	Water	Conductivity (micromhos/cm)	TDS (mg/l)	pH
1-01	Spring/79	3	-	-	-	300	-
1-01	8/14/90	1.07	20	7	360	-	7.5
2-02	Fall/79	12	-	-	-	213	-
2-02	8/13/90	0.21	14	10	324	-	.3
2-03*	Fall/79	Dry	-	-	-	-	-
2-04*	Fall/79	1	-	-	-	-	-
2-05*	Fall/79	1	-	-	-	-	-
2-06	Fall/79	Seep	-	-	-	-	-
2-06	8/13/90	Seep	-	-	-	-	-
2-07*	Fall/79	1.5	-	-	-	216	-
2-08	Fall/79	0.5	-	-	-	200	-
2-08	8/13/90	0.15	13	6	392	-	7.5
2-09	8/13/90	3.0	13	7	422	-	7.3
2-10	8/13/90	3.75	12	8	373	-	7.3
6-01	Spring/79	Seep	-	-	-	-	-
6-01	8/10/90	0.25	13	8	234	-	7.4
6-02	Spring/79	4	-	-	-	105	-
6-02	8/10/90	0.08	13	9	200	-	7.4
6-03	Spring/79	10	-	-	-	143	-
6-03	Fall/79	Seep	-	-	-	238	-
6-03	8/14/90	0.05	19	16	394	-	7.3
6-04*	Fall/79	0.5	-	-	-	140	-
6-05	Spring/79	3	-	-	-	117	-
6-05	8/14/90	Seep	-	-	-	-	-
6-06	Spring/79	1	-	-	-	146	-
6-06	8/14/90	0.85	15	10	330	-	7.3
6-10*	Spring/79	1	-	-	-	85	-
6-11	Spring/79	0.7	-	-	-	77	-
6-11	8/14/90	-	14	9	491	-	7.3
6-12*	Spring/79	0.5	-	-	-	145	-
6-13*	Spring/79	Dry	-	-	-	-	-
7-08	8/14/90	0.34	10	7	345	-	7.5
7-09*	Spring/79	0.7	-	-	-	117	-
7-10*	Spring/79	5	-	-	-	170	-
7-11	Spring/79	6	-	-	-	119	-
7-11	Fall/79	<1	-	-	-	316	-
7-11	8/14/90	0.31	11	8	520	-	7.6
19-01	Spring/79	4	-	-	-	217	-
19-01	8/08/90	0.65	22	9	403	-	7.2
19-02	8/08/90	0.44	18	7	507	-	7.6
19-03	8/08/90	1.25	12	7	467	-	7.6
19-10*	Spring/79	4	-	-	-	220	-
24-01	Spring/79	4	-	-	-	149	-
24-01	8/08/90	1.67	17	9	329	-	7.3
24-02	Fall/79	0.3	-	-	-	216	-
24-02	8/08/90	0.58	22	8	353	-	7.5
24-03*	Fall/79	Dry	-	-	-	-	-
24-04*	Fall/79	Seep	-	-	-	-	-
24-05*	Fall/79	Seep	-	-	-	-	-
24-06*	Fall/79	2	-	-	-	230	-
24-07*	Fall/79	Seep	-	-	-	-	-
24-08*	Fall/79	Dry	-	-	-	-	-
24-09*	Fall/79	Dry	-	-	-	-	-
24-10	Spring/79	1	-	-	-	-	-
24-10	8/07/90	0.21	19	14	432	-	7.4
24-11*	Spring/79	Seep	-	-	-	-	-
24-12	Fall/79	3	-	-	-	323	-
24-12	8/07/90	0.02	26	16	402	-	7.2
24-13	8/08/90	0.08	21	13	462	-	7.5
24-14	8/07/90	2.85	26	6	529	-	
25-01	Spring/79	2	-	-	-	78	-
25-01	8/07/90	1.50	18	10	421	-	7.5
25-02	Spring/79	20	-	-	-	136	-
25-02	8/07/90	0.39	20	10	344	-	7.5
25-03*	Spring/79	5	-	-	-	186	-
25-04	Spring/79	1	-	-	-	-	-
25-04	8/07/90	1.67	22	9	422	-	7.3
25-05	Spring/79	12	-	-	310	200	-
25-05	Fall/79	<1	-	-	500	330	-
25-05	8/07/90	1.88	20	5	504	-	7.4
25-06	Spring/79	10	-	-	-	298	-
25-06	Fall/79	2	-	-	-	267	-
25-06	8/07/90	1.67	14	5	541	-	7.3
25-07*	Fall/79	2	-	-	-	254	-
25-08*	Spring/79	3	-	-	-	148	-
25-09*	Spring/79	1	-	-	-	186	-
25-10	Spring/79	7	-	-	-	210	-
25-10	8/07/90	1.88	14	6	405	-	7.3
25-11	Spring/79	2	-	-	-	161	-
25-11	8/08/90	3.75	20	14	397	-	7.3
25-12*	Spring/79	0.1	-	-	-	291	-
25-13	Fall/79	0.5	-	-	-	199	-
25-13	8/08/90	0.52	20	10	246	180	7.5
25-14*	Spring/79	5	-	-	-	115	-
25-15	Spring/79	30	-	-	-	52	-
25-15*	Fall/79	Dry	-	-	-	-	-
25-16*	Spring/79	2	-	-	-	78	-
25-17	Fall/79	2	-	5	-	219	-
25-17	8/09/90	3.75	17	5	390	-	7.5
25-18	Fall/78	4	-	-	-	174	-
25-18	8/07/90	1.07	19	10	220	-	7.3
25-20*	Spring/79	5	-	-	-	43	-
25-21	Spring/79	5	-	-	-	-	-
25-21	8/08/90	0.19	16	12	252	-	7.5
25-22	Spring/79	3	-	-	-	114	-
25-22	8/08/90	0.16	21	11	278	-	7.5
25-23*	Spring/79	5	-	-	-	260	-
25-24	8/08/90	0.13	16	10	252	-	7.9
25-25	8/13/90	1.88	20	6	422	-	7.4
29-02	Spring/79	2	-	-	-	310	-
29-02	8/09/90	1.67	18	8	568	-	7.5
30-01*	Spring/79	1	-	-	-	130	-
30-02	Spring/79	0.2	-	-	-	97	-
30-02	8/08/90	0.17	16	11	325	-	8.3
30-03*	Spring/79	2	-	-	-	120	-
30-10	Spring/79	8	-	-	-	130	-
30-10	8/08/90	0.13	18	14	354	-	7.5
30-11	Spring/79	8	-	-	-	248	-
30-11	8/08/90	2.50	19	9	401	-	7.5
30-12	Spring/79	15	-	-	-	248	-
30-12	8/09/90	1.88	21	9	258	-	7.4
30-13	6/26/79	0.90	-	6	640	-	-
30-13	8/09/90	0.39	21	11	716	-	7.3
30-15	Spring/79	2	-	-	-	179	-
30-15	7/18/79	1.8	-	5	300	-	-
30-15	8/09/90	0.31	13	6	339	-	7.5
30-16	Spring/79	1	-	-	-	254	-
30-16	8/09/90	0.29	22	13	454	-	7.4
30-17	8/08/90	0.18	17	9	428	-	7.5
31-01	Spring/79	4	-	-	-	81	-
31-01	8/10/90	0.20	20	7	309	-	7.5
31-02*	Spring/79	Dry	-	-	-	-	-
31-03*	Spring/79	2	-	-	-	-	-
31-04	Spring/79	4	-	-	-	229	-
31-04	8/10/90	0.63	18	12	401	-	7.4
31-05*	Spring/79	4	-	-	-	1	-
31-06	Spring/79	1.5	-	-	-	242	-
31-06	8/09/90	0.63	12	9	369	-	7.5
31-10	Spring/79	4	-	-	-	180	-
31-10	8/10/90	0.07	14	8	381	-	7.5
31-11	Spring/79	6	-	-	-	211	-
31-11	8/10/90	1.50	12	4	442	-	7.5
31-12	Spring/79	3	-	-	-	198	-
31-12	8/14/90	0.52	19	6	373	-	7.4
31-13	Spring/79	8	-	-	-	227	-
31-13	Fall/79	2	-	-	-	233	-
31-13	8/10/90	1.36	18	8	447	-	7.5
31-14	8/10/90	0.94	16	7	292	-	7.3
31-15	8/10/90	0.94	12	5	580	-	7.4
31-16	8/13/90	0.27	16	11	390	-	7.3
32-01	Spring/79	2	-	-	-	378	-
32-01	8/09/90	1.53	20	7	539	-	7.4
32-02*	Spring/79	0.1	-	-	-	528	-
35-01*	Spring/79	2	-	-	-	224	-
35-05	Fall/79	2	-	-	-	216	-
35-05	8/13/90	7.5	15	9	396	-	7.4
35-06	Spring/79	1	-	-	-	226	-
35-06	8/13/90	0.75	18	17	398	-	7.3
35-10*	Spring/79	5	-	-	-	184	-
35-11*	Spring/79	5	-	-	-	136	-
35-12*	Spring/79	8	-	-	-	211	-
35-13	Spring/79	6	-	-	-	215	-
35-13	Fall/79	<1	-	-	-	250	-
35-13	8/13/90	0.34	12	7	286	-	7.2
35-14	8/13/90	3.75	13	8	413	-	7.3
36-01	Spring/79	0.4	-	-	-	242	-
36-01*	Fall/79	0.8	-	-	-	208	-
36-02	Spring/79	5	-	-	-	57	-
36-02	8/10/90	0.63	15	9	183	-	7.5
36-03	Spring/79	15	-	-	-	81	-
36-03	Fall/79	<1	-	-	-	233	-
36-03	8/10/90	0.83	15	4	315	-	7.3
36-04	Spring/79	5	-	-	-	86	-
36-04	8/09/90	0.94	16	3	257	-	7.4
36-05	Spring/79	1	-	-	-	115	-
36-05	8/09/90	0.58	14	10	-	-	7.5
36-06*	Spring/79	1	-	-	-	150	-
36-07	Spring/79	8	-	-	-	150	-
36-07	Fall/79	0.5	-	-	-	166	-
36-07	8/09/90	1.00	15	7	304	-	7.4
36-08	Spring/79	0.5	-	-	-	-	-
36-08	8/09/90	0.54	15	7	-	-	7.6
36-10	Spring/79	5	-	-	-	86	-
36-10	8/09/90	1.07	20	5	330	-	7.5
36-11	Spring/79	2	-	-	-	136	-
36-11	8/09/90	0.68	19	5	338	-	7.4
36-12	Spring/79	Seep	-	-	-	-	-
36-12	8/09/90	0.44	17	10	381	-	7.4
36-13	Spring/79	5	-	-	-	155	-
36-13	8/09/90	0.31	14	7	399	-	7.5
36-14*	Spring/79	1	-	-	-	-	-
36-15*	Spring/79	5	-	-	-	242	-
36-16	Spring/79	2	-	-	-	236	-
36-16	8/09/90	0.63	16	7	493	-	7.4
36-17	Spring/79	3	-	-	-	198	-
36-17	Fall/79	8	-	-	-	280	-
36-17	8/09/90	1.15	15	10	406	-	7.6
36-18	Spring/79	4	-	-	-	114	-
36-19	Spring/79	5	-	-	-	155	-
36-19	Fall/79	0.5	-	6	-	198	-
36-19	8/13/90	1.07	22	6	247	-	7.3
36-20	Spring/79	Seep	-	-	-	-	-
36-20	8/13/90	0.83	18	8	322	-	7.5
36-21	Spring/79	5	-	-	-	219	-
36-21	8/13/90	0.22	13	7	422	-	7.2
36-22	Spring/79	4	-	-	-	115	-
36-22	8/13/90	0.56	11	8	224	-	7.5
36-23	Spring/79	2	-	-	-	206	-
36-23	Fall/79	1	-	-	-	221	-
36-23	8/09/90	3.33	17	6	396	-	7.4
36-24	Fall/79	1	-	-	-	224	-
36-24	8/09/90	1.67	23	6	401	-	7.6
36-25	8/09/90	1.50	16	8	485	-	7.5
36-26	8/13/90	0.09	13	10	369	-	7.4
36-27	8/13/90	0.21	22	10	291	-	7.5

* - Seep or Spring dry in Fall 1990.

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AUG 0 5 1993
DIVISION OF OIL GAS & MINING

INCORPORATED
EFFECTIVE
APR 1 6 1993
Utah Division Oil, Gas and Mining

LEGEND:

●6-5 IDENTIFIED SEEP AND SPRING LOCATION AND IDENTIFICATION NUMBER

◁ IDENTIFIED STOCK POND LOCATION

CATIONS	YEAR (f = Fall monitoring)	ANIONS
Na		Cl
Ca		HCO_3
Mg	FLOW (gpm) / TDS (mg/l)	SO_4
8 6 4 2 0 2 4 6 8	me/l	

REGISTERED PROFESSIONAL ENGINEER
#7888
DAVID HANSEN
STATE OF UTAH

CERTIFICATION

I certify that to the best of my knowledge the information contained on this map represent true and accurate conditions as of the date the data was collected. No certification is made with respect to the accuracy of any water quality analyses.

YEAR LAST UPDATED
1990

VALLEY CAMP OF UTAH, INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

TITLE:

MAP R645-301-722.100b
SEEP AND SPRING SURVEY
UPDATE

Drawn by: JVH	Date: 9/90
Approval: DEH	Date: 9/90
Drawing No.	Rev. 1 3/93

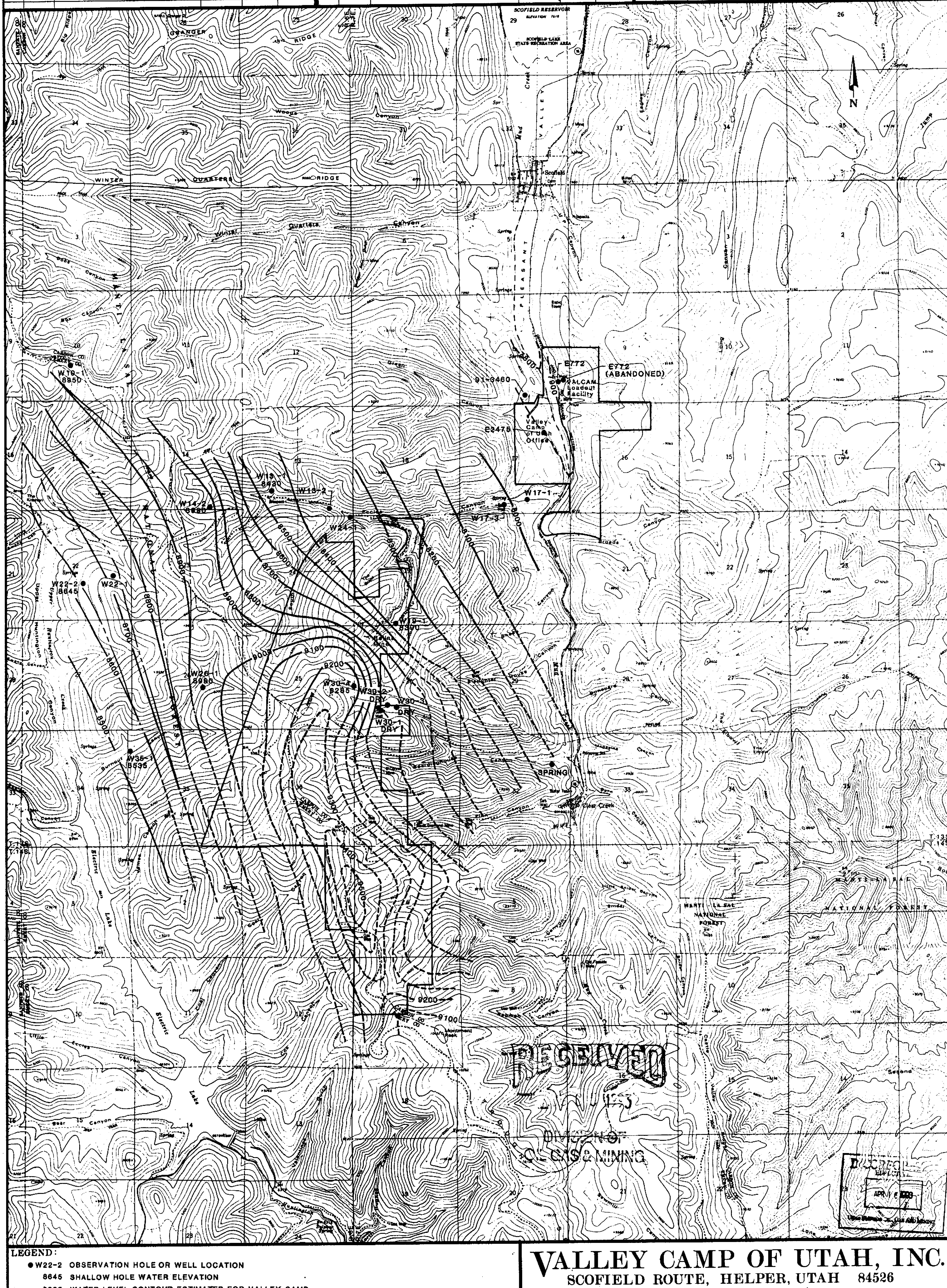
HANSEN ALLEN & LUCE INC. SALT LAKE CITY, UTAH

SCALE: 1" = 2000'

SHEET 1 OF 1

007.11.100.011A

VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM			VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM			VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS	NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS	NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



LEGEND:

- ● W22-2 OBSERVATION HOLE OR WELL LOCATION
- 8645 SHALLOW HOLE WATER ELEVATION
- - - - -8900 WATER LEVEL CONTOUR ESTIMATED FOR VALLEY CAMP
- ——8900 WATER LEVEL CONTOUR FROM COASTAL STATES REPORT
- ······· MODIFIED CONTOUR BASED ON INFO AVAILABLE FROM COASTAL STATES MINE PERMIT ON FILE AT DOGM, JAN. 1993.

HYDROLOGIC CERTIFICATION

I certify that the information contained on this drawing represents true and accurate conditions at the time it was prepared consistent with the level of accuracy obtainable from the data. Information, data, and details provided by the applicant and represented on these drawings is assumed to be true and correct.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID E. HANSEN STATE OF UTAH

VALLEY CAMP OF UTAH, INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

TITLE:	Drawn by: JVH	Date: 9/80
MAP R645-301-722.100c GROUND WATER CONTOURS	Approval: DEH	Date: 9/90
	Drawing No.	Rev. 1 3/93
HANSEN ALLEN & LUCE Salt Lake City Utah	SCALE: 1" = 2000'	SHEET 1 OF 1

097.11.100.012

VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

SUBSIDENCE SURVEY LOG - TAGGED SITES

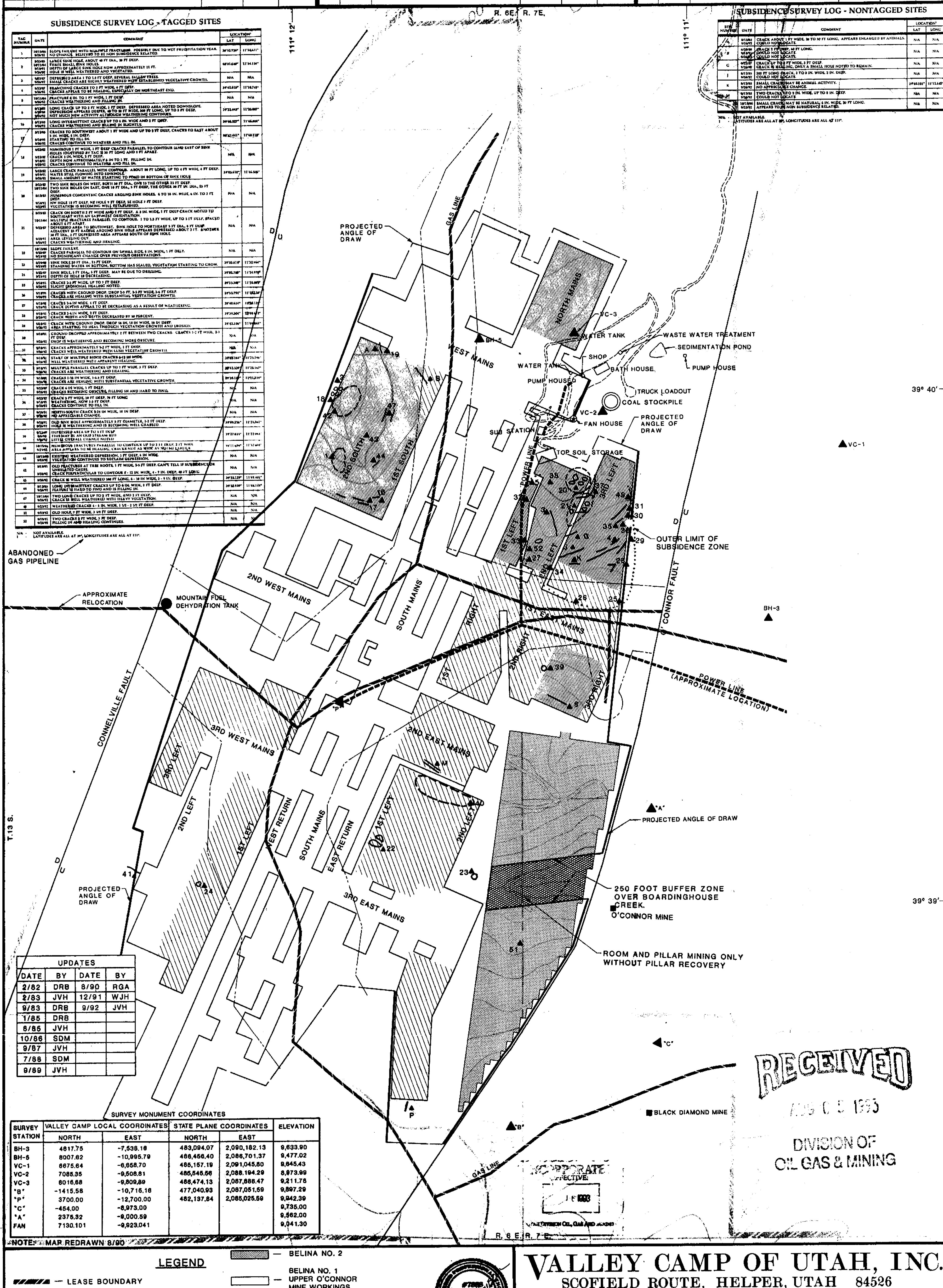
TAG NUMBER	DATE	COMMENT	LOCATION[1] LAT	LOCATION[1] LONG
1	10/15/86 9/26/92	SLOPE FAILURE WITH MULTIPLE FRACTURES. POSSIBLY DUE TO WET PRECIPITATION YEAR. NO CHANGE. BELIEVED TO BE NON SUBSIDENCE RELATED.	39°52.730"	11°54.611"
2	8/25/83 10/15/86 9/19/91 9/26/92	LARGE SINK HOLE, ABOUT 40 FT DIA., 20 FT DEEP. THREE SMALL SINK HOLES. DEPTH OF LARGE SINK HOLE NOW APPROXIMATELY 12 FT. HOLE IS WELL WEATHERED AND VEGETATED.	40°01.630"	11°54.130"
3	9/22/87 9/26/92	DEPRESSED AREA 1 TO 1.5 FT DEEP. SEVERAL FALLEN TREES. SMALL CRACKS ARE HIGHLY WEATHERED WITH ESTABLISHED VEGETATIVE GROWTH.	N/A	N/A
4	9/22/87 9/26/92	BRANCHING CRACKS TO 2 FT WIDE, 4 FT DEEP. CRACKS APPEAR TO BE HEALING, ESPECIALLY ON NORTHEAST END.	39°42.616"	11°10.749"
5	10/11/84 9/26/92	FRACTURE 6 IN. TO 1 FT WIDE, 1 FT DEEP. CRACKS WEATHERING AND FILLING IN.	N/A	N/A
6	8/13/83 6/20/86 9/26/92	LONG CRACK UP TO 2 FT WIDE, 3 FT DEEP. DEPRESSED AREA NOTED DOWNSLOPE. DEPRESSION APPEARS DEEPER, 40 TO 50 FT WIDE, 300 FT LONG, UP TO 3 FT DEEP. NOT MUCH NEW ACTIVITY ALTHOUGH WEATHERING CONTINUES.	39°23.640"	11°20.007"
16	8/13/85 9/26/92	LONG INTERMITTENT CRACKS UP TO 6 IN. WIDE AND 2 FT DEEP. CRACKS WEATHERING AND FILLING IN SLIGHTLY.	39°46.527"	11°46.804"
17	8/13/85 9/18/91 9/26/92	CRACKS TO SOUTHWEST ABOUT 1 FT WIDE AND UP TO 5 FT DEEP, CRACKS TO EAST ABOUT 3 IN. WIDE, 6 IN. DEEP. STARTING TO FILL IN. CRACKS CONTINUE TO WEATHER AND FILL IN.	39°42.441"	11°40.310"
18	8/23/83 9/22/87 9/18/91 9/25/92	NUMEROUS 1 FT WIDE, 3 FT DEEP CRACKS PARALLEL TO CONTOUR (AND EAST OF SINK HOLES IDENTIFIED BY TAG 2) 30 FT LONG AND 5 FT APART. CRACK 3 IN. WIDE, 2 FT DEEP. DEPTH NOW APPROXIMATELY 6 IN TO 1 FT. FILLING IN. CRACKS CONTINUE TO WEATHER AND FILL IN.	N/A	N/A
19	9/23/82 9/19/91 9/26/92	LARGE CRACK PARALLEL WITH CONTOUR. ABOUT 50 FT LONG, UP TO 4 FT WIDE, 4 FT DEEP. WATER STILL FLOWING INTO SINKHOLE. SMALL AMOUNT OF WATER STARTING TO POND IN BOTTOM OF SINK HOLE.	39°03.618"	11°46.506"
20	8/25/83 10/11/84 8/13/85 9/18/91 9/25/91	TWO SINK HOLES ON WEST, BOTH 30 FT DIA., ONE 15 THE OTHER 25 FT DEEP. TWO SINK HOLES ON EAST, ONE 10 FT DIA., 5 FT DEEP, THE OTHER 30 FT IN. DIA., 25 FT DEEP. NUMEROUS CONCENTRIC CRACKS AROUND SINK HOLES. 6 TO 18 IN. WIDE, 6 IN. TO 3 FT DEEP. NW HOLE 18 FT DEEP, NE HOLE 9 FT DEEP, SE HOLE 7 FT DEEP. VEGETATION IS BECOMING WELL ESTABLISHED.	N/A	N/A
21	8/25/83 10/11/84 9/22/87 9/18/91 9/16/92	CRACK ON NORTH 2 FT WIDE AND 2 FT DEEP. A 3 IN. WIDE, 1 FT DEEP CRACK NOTED TO SOUTHEAST WITH AN EAST-WEST ORIENTATION. MULTIPLE FRACTURES PARALLEL TO CONTOUR. 1 TO 1.5 FT WIDE, UP TO 5 FT DEEP, SPACED ABOUT 6 FT APART. DEPRESSED AREA TO SOUTHWEST. SINK HOLE TO NORTHEAST 5 FT DIA., 6 FT DEEP. ADJACENT 15 FT RADIUS AROUND SINK HOLE APPEARS DEPRESSED ABOUT 2 FT. ANOTHER 30 FT DIA., 2 FT DEPRESSED AREA APPEARS SOUTH OF SINK HOLE. AREA LEVELING OUT. CRACKS WEATHERING AND HEALING.	N/A	N/A
22	10/15/86 9/22/87 9/25/92	SLOPE FAILURE. CRACKS PARALLEL TO CONTOUR ON UPHILL SIDE, 6 IN. WIDE, 1 FT DEEP. NO SIGNIFICANT CHANGE OVER PREVIOUS OBSERVATIONS.	N/A	N/A
23	6/29/88 9/25/92	SINK HOLE 20 FT DIA., 15 FT DEEP. STANDING WATER IN BOTTOM, BOTTOM HAS SEALED, VEGETATION STARTING TO GROW.	39°03.618"	11°32.961"
24	9/22/87 9/25/91	SINK HOLE, 5 FT DIA., 5 FT DEEP. MAY BE DUE TO DRILLING. DEPTH OF HOLE IS DECREASING.	39°02.780"	11°14.970"
25	9/18/91 9/26/92	CRACKS 2-3 FT WIDE, UP TO 3 FT DEEP. SLIGHT EROSIONAL HEALING NOTED.	39°35.340"	11°10.007"
26	9/18/91 9/26/92	CRACKS WITH GROUND DROP. DROP 3-5 FT, 3-5 FT WIDE, 3-6 FT DEEP. CRACKS ARE HEALING WITH SUBSTANTIAL VEGETATION GROWTH.	39°35.791"	[illegible]
27	9/18/90 9/26/92	CRACKS 3-6 IN WIDE, 4 FT DEEP. CRACK DEPTHS APPEAR TO BE DECREASING AS A RESULT OF WEATHERING.	39°40.614"	[illegible]
28	9/18/91 9/26/92	CRACKS 2-4 IN WIDE, 2 FT DEEP. CRACK WIDTH AND DEPTH DECREASED BY 50 PERCENT.	39°39.304"	[illegible]
29	9/18/91 9/26/92	CRACK WITH GROUND DROP. DROP 16 IN, 18 IN WIDE, 18 IN DEEP. AREA STARTING TO HEAL THROUGH VEGETATION GROWTH AND EROSION	39°43.356"	[illegible]
30	9/18/91 9/26/92	GROUND DROPPED APPROXIMATELY 2 FT BETWEEN TWO CRACKS. CRACKS 1-2 FT WIDE, 2-3 FT DEEP. DROP IS WEATHERING AND BECOMING MORE OBSCURE.	N/A	N/A
31	9/18/91 9/26/92	CRACKS APPROXIMATELY 1-2 FT WIDE, 1 FT DEEP. CRACKS WELL WEATHERED WITH LUSH VEGETATIVE GROWTH.	N/A	N/A
32	9/18/91 9/26/92	START OF MULTIPLE RIDGE CRACKS 6-12 IN WIDE. WELL WEATHERED WITH APPARENT HEALING.	[illegible]	11°25.196"
33	9/18/91 9/26/92	MULTIPLE PARALLEL CRACKS UP TO 2 FT WIDE, 3 FT DEEP. CRACKS ARE WEATHERING AND HEALING.	39°42.530"	11°26.167"
34	9/18/91 9/26/92	CRACKS 1-18 IN WIDE, 1-4.5 FT DEEP. CRACKS ARE HEALING WITH SUBSTANTIAL VEGETATIVE GROWTH.	[illegible]	11°21.219"
35	9/22/87 9/26/92	CRACK 6 IN WIDE, 1 FT DEEP. CRACKS BECOMING OBSCURE, FILLING IN AND HARD TO FIND.	N/A	N/A
36	9/22/87 9/18/91 9/26/92	CRACK 3 FT WIDE, 10 FT DEEP, 70 FT LONG WEATHERING, NOW 1-3 FT DEEP. CRACKS CONTINUE TO FILL IN.	N/A	N/A
37	9/18/91 9/26/92	NORTH-SOUTH CRACK 8-24 IN WIDE, 18 IN DEEP. NO APPRECIABLE CHANGE.	N/A	N/A
38	9/18/91 9/26/92	OLD SINK HOLE APPROXIMATELY 5 FT DIAMETER, 1-2 FT DEEP. HOLE IS WEATHERING AND IS BECOMING WELL GRASSED.	39°49.356"	11°21.361"
39	9/22/87 6/6/90 9/26/92	DEPRESSED AREA UP TO 5 FT DEEP THIS MAY BE AN OLD STREAM BED LITTLE OVERALL CHANGE NOTED	39°27.655"	11°22.061"
40	10/15/86 9/25/92	NUMEROUS FRACTURES PARALLEL TO CONTOUR UP TO 3 FT DEEP, 2 FT WIDE AREA APPEARS TO BE HEALING. CRACKS NOT AS WIDE AS NOTED EARLIER	39°11.699"	11°12.601"
41	10/15/86 9/25/92	EXISTING WEATHERED DEPRESSION, 1 FT DEEP, 6 IN WIDE. VEGETATION CONTINUES TO RECLAIM DEPRESSION.	N/A	N/A
42	9/18/91 9/26/92	OLD FRACTURES AT TREE ROOTS, 1 FT WIDE, 3-5 FT DEEP. CAN'T TELL IF SUBSIDENCE OR UNRELATED CAUSE. CRACK PERPENDICULAR TO CONTOUR 8 - 12 IN. WIDE, 4 - 7 IN. DEEP, 40 FT LONG	N/A	N/A
43	9/26/92	CRACK IS WELL WEATHERED 100 FT LONG, 6 - 10 IN WIDE, 2 - 9 IN. DEEP.	39°55.139"	11°49.401"
44	8/13/85 9/26/92	LONG INTERMITTENT CRACKS UP TO 6 IN. WIDE, 3 FT DEEP. FEATURE IS HARD TO FIND AND IS FILLING IN.	39°52.930"	11°48.134"
47	10/11/84 9/26/92	TWO LONG CRACKS UP TO 2 FT WIDE, AND 3 FT DEEP. CRACK IS WELL WEATHERED WITH HEAVY VEGETATION.	N/A	N/A
49	9/25/92	WEATHERED CRACKS 4 - 6 IN. WIDE, 1 1/2 - 2 1/2 FT DEEP.	N/A	N/A
51	9/25/92	OLD HOLE, 7 FT WIDE, 3 1/2 FT DEEP.	N/A	N/A
53	9/18/91 9/26/92	TWO CRACKS 3 FT WIDE, 3 FT DEEP. FILLING IN AND HEALING CONTINUES.	N/A	N/A

N/A - NOT AVAILABLE.
1 - LATITUDES ARE ALL AT 39°, LONGITUDES ARE ALL AT 111°.

SUBSIDENCE SURVEY LOG - NONTAGGED SITES

SITE NUMBER	DATE	COMMENT	LOCATION[1] LAT	LOCATION[1] LONG
A	8/13/85 9/26/92	CRACK ABOUT 1 FT WIDE, 20 TO 30 FT LONG, APPEARS ENLARGED BY ANIMALS. COULD NOT LOCATE.	N/A	N/A
B	6/29/88 9/18/91 9/26/92	CRACK 2 FT DEEP, 60 FT LONG. COULD NOT LOCATE. COULD NOT LOCATE.	N/A	N/A
C	9/22/87 9/26/92	CRACK UP TO 2 FT WIDE, 3 FT DEEP. CRACK IS HEALING, ONLY A SMALL HOLE NOTED TO REMAIN.	N/A	N/A
J	8/12/85 9/26/92	200 FT LONG CRACK, 1 TO 3 IN. WIDE, 2 IN. DEEP. COULD NOT LOCATE.	N/A	N/A
K	8/12/85 9/26/92	SMALL CRACK, MAY BE ANIMAL ACTIVITY. NO APPRECIABLE CHANGE.	39°40.101"	11°12.640"
M	8/12/85 9/26/92	TWO CRACKS UP TO 2 IN. WIDE, UP TO 8 IN. DEEP. COULD NOT LOCATE.	N/A	N/A
[illegible]	10/15/86 9/25/92	SMALL CRACK, MAY BE NATURAL, 6 IN. WIDE, 30 FT LONG. APPEARS TO BE NON SUBSIDENCE RELATED.	N/A	N/A

N/A - NOT AVAILABLE.
1 - LATITUDES ARE ALL AT 39°, LONGITUDES ARE ALL AT 111°.



RECEIVED
DIVISION OF OIL GAS & MINING
INCORPORATED
EFFECTIVE:

UPDATES			
DATE	BY	DATE	BY
2/82	DRB	8/90	RGA
2/83	JVH	12/91	WJH
9/83	DRB	9/92	JVH
1/85	DRB		
6/86	JVH		
10/86	SDM		
9/87	JVH		
7/88	SDM		
9/89	JVH		

SURVEY MONUMENT COORDINATES

SURVEY STATION	VALLEY CAMP LOCAL COORDINATES NORTH	VALLEY CAMP LOCAL COORDINATES EAST	STATE PLANE COORDINATES NORTH	STATE PLANE COORDINATES EAST	ELEVATION
BH-3	4617.75	-7,538.18	483,094.07	2,090,182.13	9,633.90
BH-5	8007.62	-10,995.79	486,456.40	2,086,701.37	9,477.02
VC-1	6675.64	-6,658.70	485,157.19	2,091,045.80	9,645.43
VC-2	7085.35	-9,508.81	485,545.56	2,088,194.29	8,973.99
VC-3	8016.68	-9,809.89	486,474.13	2,087,886.47	9,211.76
"B"	-1415.56	-10,715.16	477,040.93	2,087,051.59	9,897.29
"P"	3700.00	-12,700.00	482,137.84	2,085,025.59	9,942.39
"C"	-454.00	-8,973.00			9,735.00
"A"	2376.32	-9,000.59			9,562.00
FAN	7130.101	-9,923.041			9,041.30

NOTE: MAP REDRAWN 8/90

LEGEND

- LEASE BOUNDARY
- GAS LINE
- BH-5 — SURVEY MONUMENT
- 24 — TAGGED SUBSIDENCE FEATURES
- P — NONTAGGED SUBSIDENCE FEATURES
- SURFACE CRACK
- SINKHOLE
- APPROXIMATE AREA OF SUBSIDENCE FEATURE
- BOARDINGHOUSE CREEK BUFFER ZONE
- PIPE COVER LINES (@ 35° DRAW ANGLE)
- BELINA NO. 2
- BELINA NO. 1 UPPER O'CONNOR MINE WORKINGS
- PILLARED AREA
- FULL SEAM EXTRACTION
- PROJECTED COAL ANGLE OF DRAW
- FAULT INFLUENCED ANGLE OF DRAW

CERTIFICATION

I certify that to the best of my knowledge the subsidence information contained on this map is true and accurate of field conditions noted at the time the data was collected.

DAVID HANSEN

VALLEY CAMP OF UTAH, INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

TITLE: MAP R645-301-728.100a SUBSIDENCE BASE MAP

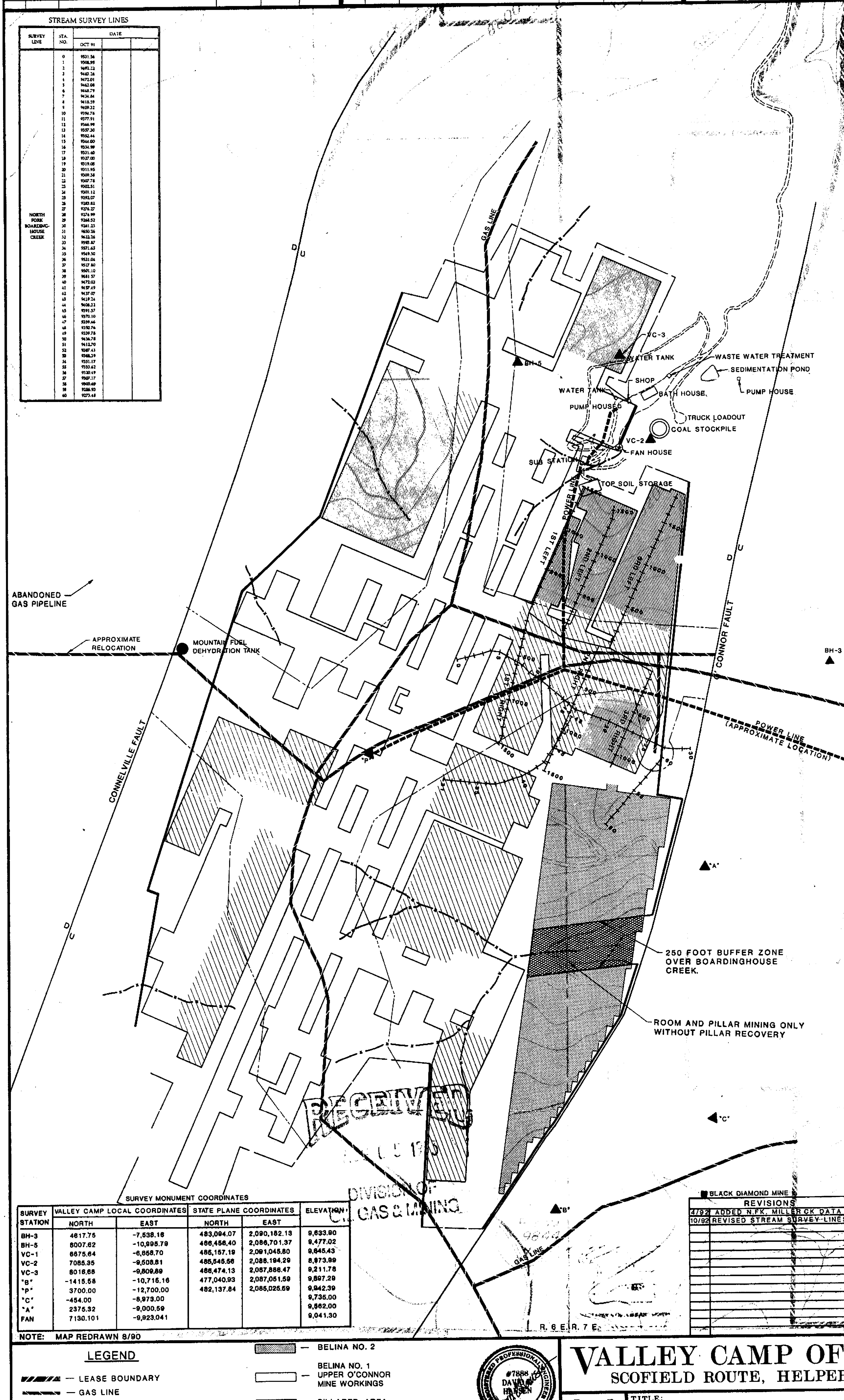
Drawn by: RGA Date: 9/90
Approval: DEH Date: 9/90
Drawing No. Rev. 1 3/93

HANSEN ALLEN & LUCE INC Salt Lake City Utah

SCALE: 1" = 500' SHEET 1 OF 1

007.11.100.014

VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



STREAM SURVEY LINES

SURVEY LINE	STA. NO.	DATE OCT 91		
NORTH FORK BOARDING-HOUSE CREEK	0	9531.56		
	1	9508.95		
	2	9492.22		
	3	9483.26		
	4	9472.01		
	5	9463.08		
	6	9448.79		
	7	9434.84		
	8	9418.59		
	9	9409.32		
	10	9394.76		
	11	9377.91		
	12	9366.99		
	13	9357.30		
	14	9352.44		
	15	9344.00		
	16	9334.99		
	17	9331.40		
	18	9327.00		
	19	9319.05		
	20	9311.95		
	21	9309.34		
	22	9307.78		
	23	9302.51		
	24	9301.12		
	25	9292.07		
	26	9283.83		
	27	9276.27		
	28	9274.99		
	29	9268.52		
	30	9261.23		
	31	9650.26		
	32	9622.26		
	33	9593.87		
	34	9571.63		
	35	9549.50		
	36	9531.04		
	37	9517.80		
	38	9501.10		
	39	9481.57		
	40	9472.03		
	41	9457.49		
	42	9437.07		
	43	9419.24		
	44	9406.31		
	45	9391.57		
	46	9370.10		
	47	9359.46		
	48	9350.76		
	49	9339.78		
	50	9434.78		
	51	9412.70		
	52	9387.43		
	53	9368.39		
	54	9351.17		
	55	9333.62		
	56	9320.49		
	57	9307.17		
	58	9300.69		
	59	9286.93		
	60	9273.48		

STREAM SURVEY LINES

SURVEY LINE	STA. NO.	OCT 83	AUG 90	OCT 92
1st RIGHT	0	9504.26	*	*
	50	9506.97	9505.98	9506.16
	100	9497.87	9492.27	9498.13
	150	9487.79	9487.77	9487.93
	200	9475.01	9474.98	9475.16
	250	9464.87	9464.83	9465.01
	300	9454.88	[illegible]	9456.45
	350	9442.56	9442.38	9442.51
	400	9430.07	9429.84	9430.03
	450	9417.44	9417.27	9417.43
	500	9403.66	9403.53	9403.71
	550	9389.72	9389.56	9389.75
	600	9390.33	*	9390.12
	650	9404.49	9404.29	9404.48
	700	9418.80	9418.72	9418.90
	750	9429.84	9429.57	9429.73
	800	9440.87	9440.77	9440.90
	850	9449.78	9449.74	9449.85
	900	9457.89	9457.43	9457.50
	950	9463.77	9463.72	9463.88
	1000	9467.62	9467.49	9467.66
	1050	9470.53	9470.22	9470.48
	1100	9475.18	9475.10	9475.26
	1150	9483.44	9483.50	9483.57
	1200	9497.18	9497.39	9497.35
	1250	9515.53	9515.49	9515.65
	1300	9531.11	9531.14	9531.20
	1350	9540.05	9539.79	9539.93
	1400	9537.94	9537.50	9538.07
	1450	9536.69	*	*
	1500	9538.25	9538.22	9538.37
2nd RIGHT	0	9488.82	9488.78	9488.76
	50	9480.72	*	*
	100	9469.39	9469.15	9469.12
	150	9457.46	9457.31	9457.28
	200	9451.34	9451.17	9451.16
	250	9438.06	9438.08	9437.85
	300	9425.95	9425.79	9425.98
	350	9412.73	*	*
	400	9397.91	9397.93	9397.96
	450	9384.43	*	*
	500	9370.93	9370.87	9370.91
	550	9354.66	9354.25	9354.30
	600	9341.36	9341.03	9341.09
	650	9333.86	9333.55	9333.60
	700	9330.53	9329.98	9330.01
	750	9329.39	9328.51	9328.54
	800	9333.11	9332.29	9332.26
	850	9333.82	9333.04	9333.06
	900	9339.19	9338.57	9338.57
	950	9342.41	9341.87	9341.86
	1000	9350.98	9350.44	9350.44
	1050	9360.16	9359.70	9359.70
	1100	9368.71	9368.38	9368.36
	1150	9377.02	9376.82	9376.83
	1200	9387.10	9386.95	9387.08
	1250	9393.44	9393.47	9393.53
	1300	9399.16	9399.23	9399.29
	1350	9405.18	9405.29	9405.35
	1400	9411.48	9411.50	9411.58
	1450	9419.98	*	*
	1500	9427.23	9427.34	9427.43

* MONUMENT NOT FOUND

SURVEY LINE	STA. NO.	OCT 83	AUG 90	OCT 92
3rd RIGHT	0	9471.16	9471.15	9471.75
	50	9454.88	9454.96	9454.80
	100	9440.31	9440.33	9440.40
	150	9426.60	9426.62	9426.69
	200	9412.56	9412.84	9412.64
	250	9398.42	9398.41	9398.52
	300	9382.10	*	*
	350	9367.92	9367.67	9368.04
	400	9353.30	9353.30	9353.47
	450	9339.76	9339.67	9339.86
	500	9325.39	9324.88	9325.11
	550	9310.97	9310.82	9311.04
	600	9297.05	9296.81	9297.06
	650	9294.24	*	*
	700	9296.55	9296.21	9296.38
	750	9306.40	9306.41	9306.60
	800	9320.12	9319.72	9319.27
	850	9333.01	9331.79	9331.82
	900	9348.44	9347.32	9347.36
	950	9363.52	9362.11	9362.37
	1000	9377.07	9376.22	9376.25
	1050	9390.16	9389.70	9389.74
	1100	9405.42	9404.86	9404.92
	1150	9417.40	9417.26	9417.20
1st LEFT	0	9504.26	*	*
	50	9491.41	9491.61	9491.54
	100	9476.35	9476.67	9476.43
	150	9462.46	9462.61	9462.56
	200	9449.63	9449.62	9449.21
	250	9438.28	9438.28	9438.32
	300	9427.84	9427.85	9427.66
	350	9414.36	9414.16	9414.11
	400	9395.50	9395.50	9395.34
	450	9381.33	9380.83	9380.80
	500	9367.60	9367.29	9367.15
	550	9355.90	9355.56	9355.67
	600	9343.81	9343.51	9343.39
	650	9328.43	9328.34	9327.88
	700	9312.26	9312.05	9311.66
	750	9299.06	9298.57	9298.46
	800	9286.10	9285.85	9285.61
	850	9273.21	9273.02	9272.75
	900	9256.84	9259.94	9258.53
	950	9243.53	9243.94	9242.99
	1000	9229.30	9228.82	9228.65
	1050	9219.84	9215.60	9215.39
	1100	9203.79	9203.66	9203.41
	1150	9193.37	9193.22	9193.03
	1200	9177.83	9179.61	9177.46
	1250	9162.47	9162.21	9162.01
	1300	9147.31	9147.08	9146.89
	1350	9132.48	9132.24	[illegible]
	1400	9122.01	*	*
	1450	9107.34	9107.06	9106.85
	1500	9098.12	9094.80	9094.74
2nd LEFT	0	9478.56	*	9478.49
	50	9479.13	*	9479.12
	100	9474.89	9474.92	9474.81
	150	9464.16	9464.16	9464.00
	200	9449.51	9448.64	9449.21
	250	9434.07	9433.77	9433.65
	300	9417.48	9417.16	9416.60
	350	9403.81	9403.07	9401.84
	400	9380.96	9379.56	9376.86
	450	9364.93	9364.85	9360.39
	500	9354.34	9354.06	9344.42
	550	9339.19	9338.72	9330.92
	600	9318.25	*	*
	650	9294.43	9294.09	9284.07
	700	9276.64	9276.66	9268.17
	750	9262.31	9261.09	9253.12
	800	9248.26	9248.10	9240.70
	850	9237.17	9237.24	9229.85
	900	9222.56	9222.44	[illegible]
	950	9211.61	9210.94	9206.02
	1000	9200.60	9200.82	9195.64
	1050	9190.56	9190.49	9186.08
	1100	9178.95	9178.87	9175.24
	1150	9164.98	9163.89	9161.20
	1200	9154.18	9153.89	9152.82
	1250	9144.82	9144.51	9144.29
	1300	9133.75	9133.46	9133.66
	1350	9118.02	9117.68	9117.76
	1400	9102.16	9102.90	9102.87
	1450	9094.01	9093.71	9093.71
	1500	9083.10	9082.69	9082.69
3rd LEFT	0	9490.54	9490.50	9490.49
	50	9491.92	9491.89	9491.56
	100	9486.17	9485.96	9485.75
	150	9476.74	9476.06	9473.57
	200	9463.89	9462.70	9459.86
	250	9450.89	9449.25	9445.91
	300	9438.05	9435.90	9432.14
	350	9422.72	9420.03	9415.79
	400	9406.46	9402.84	9398.16
	450	9388.41	9384.38	9379.31
	500	9372.32	*	*
	550	9361.33	9356.40	9350.95
	600	9353.93	9347.83	9342.28
	650	9345.10	9340.30	9334.47
	700	9336.33	9331.50	9325.64
	750	9324.63	9318.81	9314.15
	800	9314.18	9311.26	9304.21
	850	9309.80	9304.02	9299.23
	900	9301.27	9296.96	9292.23
	950	9288.33	9284.94	9284.86
	1000	9267.33	9266.70	9262.24
	1050	9257.20	9256.96	9252.64
	1100	9248.86	9249.69	9245.65
	1150	9242.83	9242.73	9238.00
	1200	9234.45	9236.28	9232.68
	1250	9230.87	9230.80	9227.11
	1300	9225.27	9225.19	9221.03
	1350	9219.16	9219.01	9215.30
	1400	9214.09	9214.03	9210.41
	1450	9209.09	9208.91	9205.64
	1500	9204.16	9204.05	9200.31
	1550	9200.57	9200.49	9196.91
	1600	9196.01	9196.14	9195.10
	1650	9192.07	9191.92	9191.47
	1700	9187.05	9186.81	9184.66
	1750	9181.61	9181.46	9181.38
	1800	9177.36	9177.34	9177.45

* MONUMENT NOT FOUND

REVISIONS	
4/92	ADDED N.FK. MILLER CK DATA
10/92	REVISED STREAM SURVEY LINES

SURVEY MONUMENT COORDINATES

SURVEY STATION	VALLEY CAMP LOCAL COORDINATES NORTH	EAST	STATE PLANE COORDINATES NORTH	EAST	ELEVATION
BH-3	4617.75	-7,538.16	483,094.07	2,090,182.13	9,633.90
BH-5	8007.62	-10,895.79	486,458.40	2,086,701.37	9,477.02
VC-1	6875.64	-6,658.70	485,157.19	2,091,045.80	9,645.43
VC-2	7085.35	-9,508.81	485,545.56	2,088,194.29	8,973.89
VC-3	8016.68	-9,809.89	486,474.13	2,087,888.47	9,211.78
"B"	-1415.58	-10,716.16	477,040.93	2,087,051.59	9,897.29
"P"	3700.00	-12,700.00	482,137.84	2,085,025.59	9,942.39
"C"	-454.00	-8,973.00			9,735.00
"A"	2375.32	-9,000.59			9,562.00
FAN	7130.101	-9,923.041			9,041.30

NOTE: MAP REDRAWN 8/90

LEGEND

- LEASE BOUNDARY
- GAS LINE
- BH-5 — SURVEY MONUMENT
- EXISTING SURVEY LINE WITH STATION
- FUTURE POTENTIAL STREAM SURVEY LINE
- BOARDINGHOUSE CREEK BUFFER ZONE
- PIPE COVER LINES (@ 35° DRAW ANGLE)
- BELINA NO. 2
- BELINA NO. 1 UPPER O'CONNOR MINE WORKINGS
- PILLARED AREA
- FULL SEAM EXTRACTION
- PROJECTED COAL ANGLE OF DRAW
- FAULT INFLUENCED ANGLE OF DRAW

CERTIFICATION

I certify that to the best of my knowledge the subsidence information contained on this map is true and accurate of field conditions noted at the time the data was collected.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID W. HANSEN STATE OF UTAH

VALLEY CAMP OF UTAH, INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

TITLE:

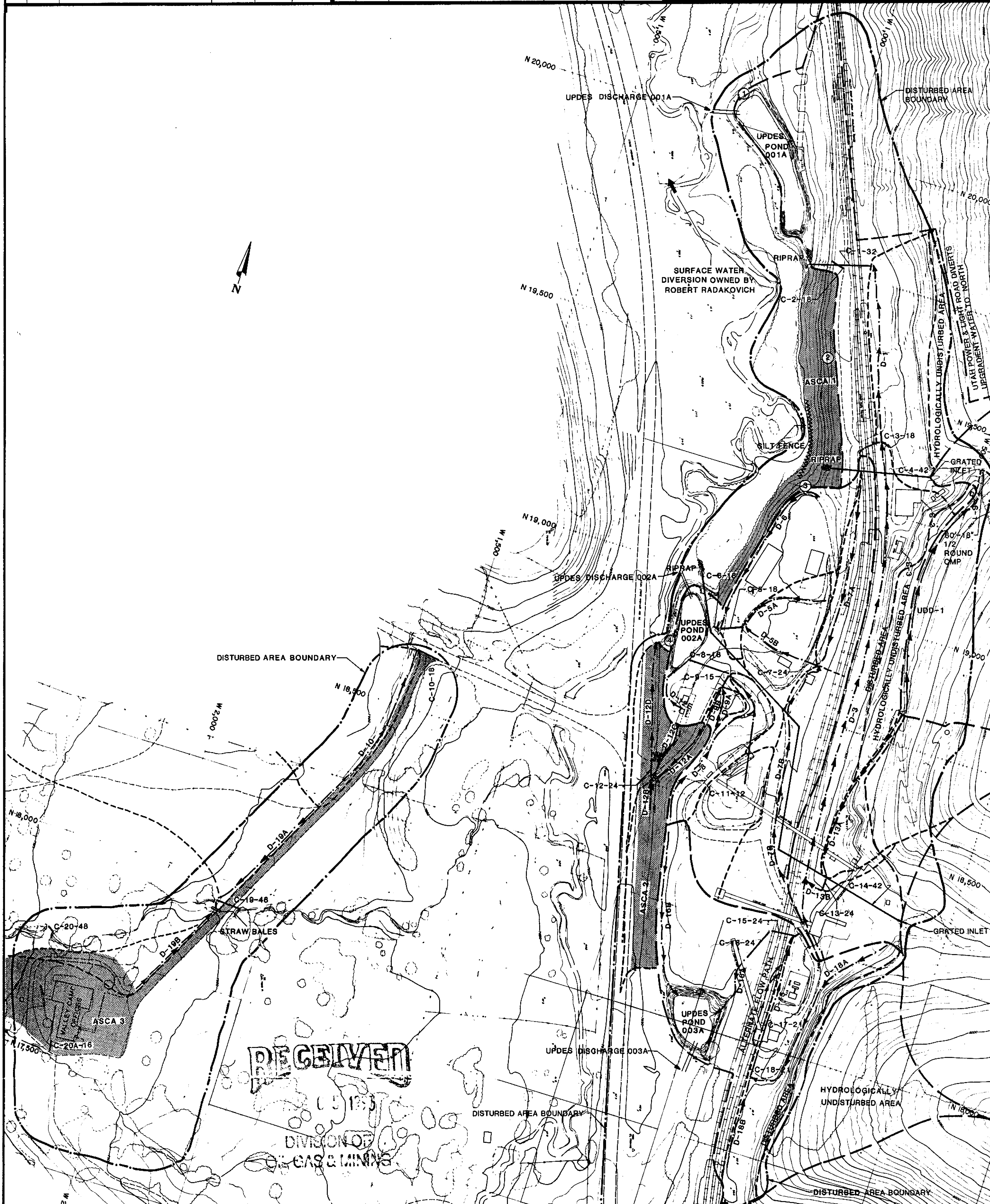
MAP R645-301-728.100b
SUBSIDENCE SURVEY LOCATION MAP

HANSEN ALLEN & LUCE INC. Salt Lake City Utah

Drawn by: JVH	Date: 1/91
Approval: DEH	Date: 1/91
Drawing No.	Rev. 1 3/93
SCALE: 1" = 500'	SHEET 1 OF 1

007.011.100.014A

VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM			VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM			VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS	NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS	NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



HYDROLOGIC CERTIFICATION

I certify that the information contained on this drawing represents sediment control facilities located on the permit area for the date shown. Locations of the runoff facilities are not surveyed, but are shown on the map as best determined in the field. Information related to buried culverts as provided by the applicant is assumed to be true and correct.

LEGEND:

- DISTURBED AREA BOUNDAARY
- CULVERT OR DITCH DRAINAGE BOUNDARY
- SEDIMENT POND DRAINAGE BOUNDARY
- UDD-1 UNDISTURBED AREA DRAINAGE DITCH NO. 1
- C-14-42 CULVERT NO. 14, DIAMETER 42 INCHES
- D-18A DITCH NO. 18A, NOTE THAT DITCH NUMBER CORRELATES WITH LOCAL CULVERT NO.
- (4) STREAM BUFFER ZONE SIGN NO. 4
- STRAW BALE OR ROCK GABION
- ▷ SEDIMENT TRAP

NOTES:

1) TRIBUTARY AREAS FOR DITCHES AND CULVERTS HAVING A MAJOR PORTION OF THEIR DRAINAGE AREAS NOT SHOWN ON THIS FIGURE, ARE SHOWN ON FIGURE 742.310a
2) DRAINAGE BASINS FOR UNDISTURBED AREA BYPASS DITCHES ARE DISCUSSED IN THE SEDIMENT POND REPORT COMPLETED BY HANSEN, ALLEN & LUCE, 1989.
3) POND SPILLWAYS SHOWN ON FIGURES 731.750a AND 731.750b.

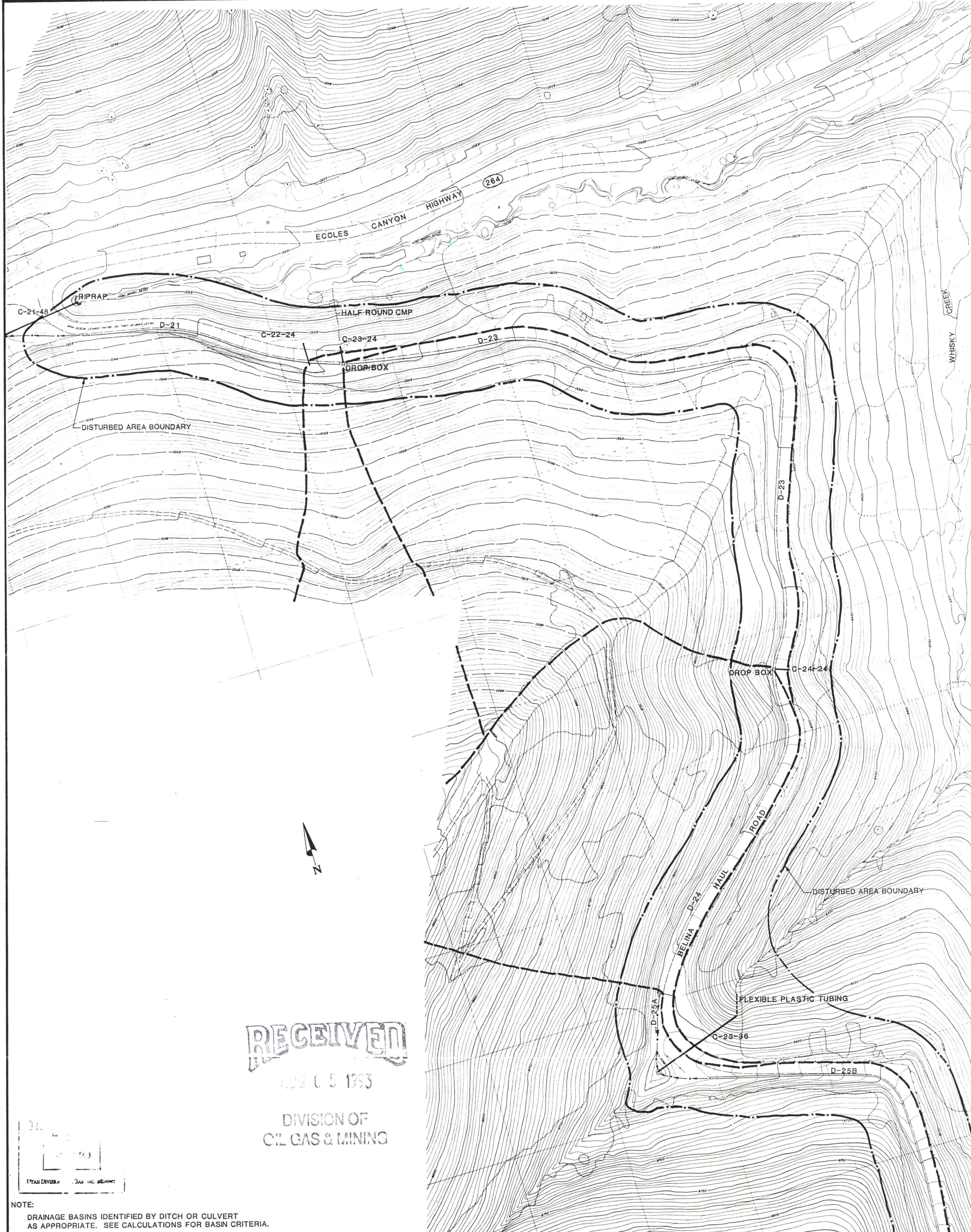
VALLEY CAMP OF UTAH, INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

TITLE:	Drawn by: DEH, WJH	Date: 8/89
MAP R645-301-731.720a VALCAM SEDIMENT CONTROL FACILITIES	Approval: DEH	Date: 9/90
	Drawing No.	Rev. 1 3/93
HANSEN ALLEN & LUCE INC Salt Lake City Utah	SCALE: 1" = 100'	SHEET 1 OF 1

007.11.100.015

VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM			VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM			VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS	NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS	NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



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AUG 05 1993
DIVISION OF
OIL GAS & MINING

NOTE:

DRAINAGE BASINS IDENTIFIED BY DITCH OR CULVERT AS APPROPRIATE. SEE CALCULATIONS FOR BASIN CRITERIA.

LEGEND:

C-25-36 CULVERT NUMBER 25 (36 INCH DIAMETER)

DRAINAGE BASIN BOUNDARY

DISTURBED AREA BOUNDARY

NOTES: 1) COMPLETE DRAINAGE BASIN BOUNDARIES FOR IDENTIFIED CULVERTS ARE SHOWN ON MAP 742.310a

2) CONCRETE DITCH PARALLELS INSIDE SHOULDER OF BELINA HAUL ROAD

HYDROLOGIC CERTIFICATION

I certify that the information contained on this drawing represents sediment control facilities located on the permit area for the date shown. Locations of the runoff facilities are not surveyed, but are shown on the map as best determined in the field. Information related to buried culverts as provided by the applicant is assumed to be true and correct.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID E. HANSEN STATE OF UTAH

VALLEY CAMP OF UTAH, INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

TITLE: MAP R645-301-731.720b LOWER BELINA HAUL ROAD SEDIMENT CONTROL FACILITIES

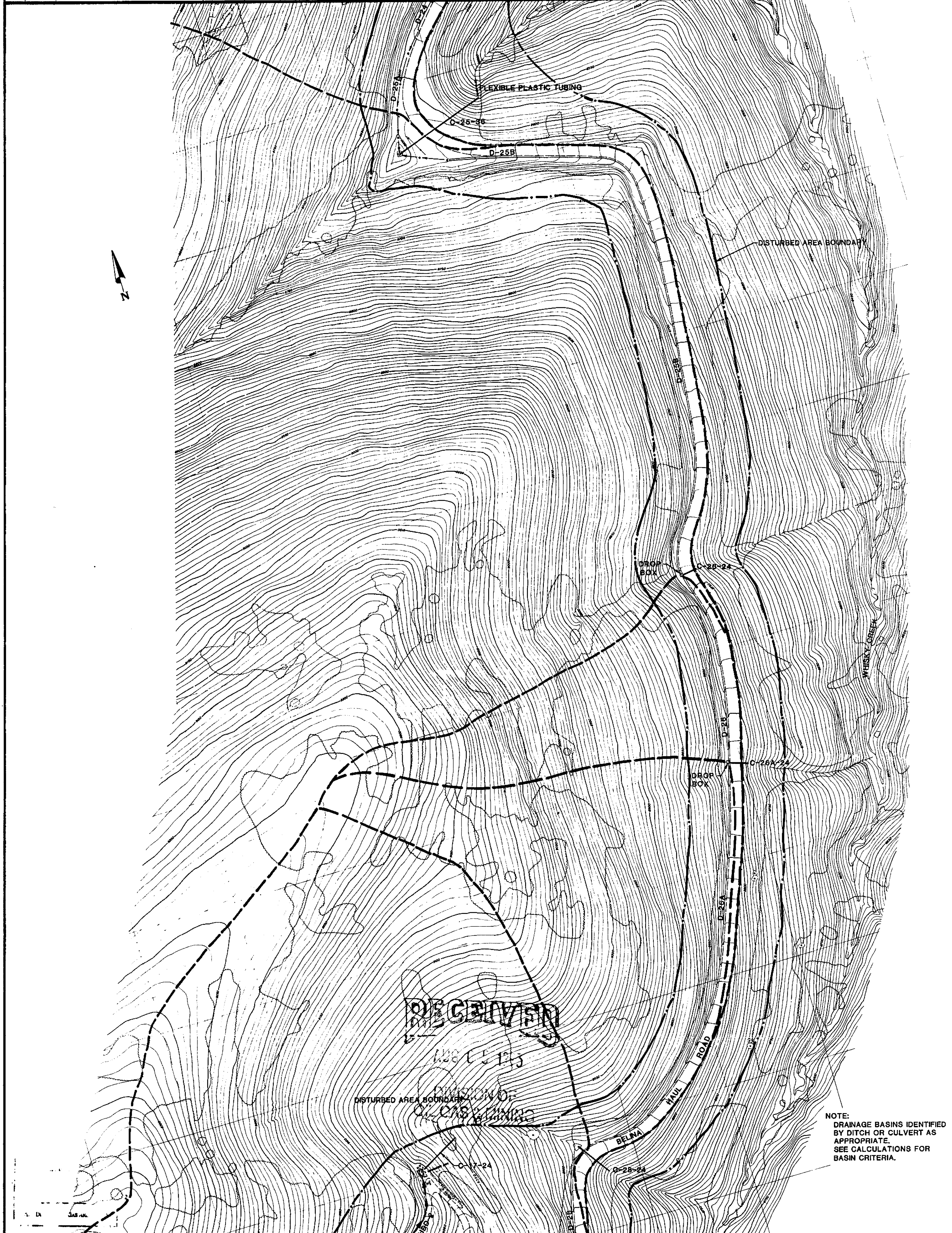
Drawn by: DCR — Date: 8/89
Approval: DEH — Date: 9/90
Drawing No. — Rev. 1 3/93

HANSEN ALLEN & LUCE inc — Salt Lake City Utah

SCALE: 1"=100' — SHEET 1 OF 1

007.11.100.016

NO.	DATE	VALLEY CAMP ACT/007/001 REVISION DESCRIPTION	INCORPORATED INTO MRP BY DOGM REF. NO.	DATE	INITIALS	NO.	DATE	VALLEY CAMP ACT/007/001 REVISION DESCRIPTION	INCORPORATED INTO MRP BY DOGM REF. NO.	DATE	INITIALS	NO.	DATE	VALLEY CAMP ACT/007/001 REVISION DESCRIPTION	INCORPORATED INTO MRP BY DOGM REF. NO.	DATE	INITIALS



NOTE:
DRAINAGE BASINS IDENTIFIED BY DITCH OR CULVERT AS APPROPRIATE.
SEE CALCULATIONS FOR BASIN CRITERIA.

LEGEND:

C-25-36 — CULVERT NUMBER 25 (36 INCH DIAMETER)

DRAINAGE BASIN BOUNDARY

DISTURBED AREA BOUNDARY

NOTES:
1) COMPLETE DRAINAGE BASIN BOUNDARIES FOR IDENTIFIED CULVERTS ARE SHOWN ON MAP 742.310a
2) CONCRETE DITCH PARALLELS INSIDE SHOULDER OF BELINA HAUL ROAD

HYDROLOGIC CERTIFICATION

I certify that the information contained on this drawing represents sediment control facilities located on the permit area for the date shown. Locations of the runoff facilities are not surveyed, but are shown on the map as best determined in the field. Information related to buried culverts as provided by the applicant is assumed to be true and correct.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID E. HANSEN STATE OF UTAH

VALLEY CAMP OF UTAH, INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

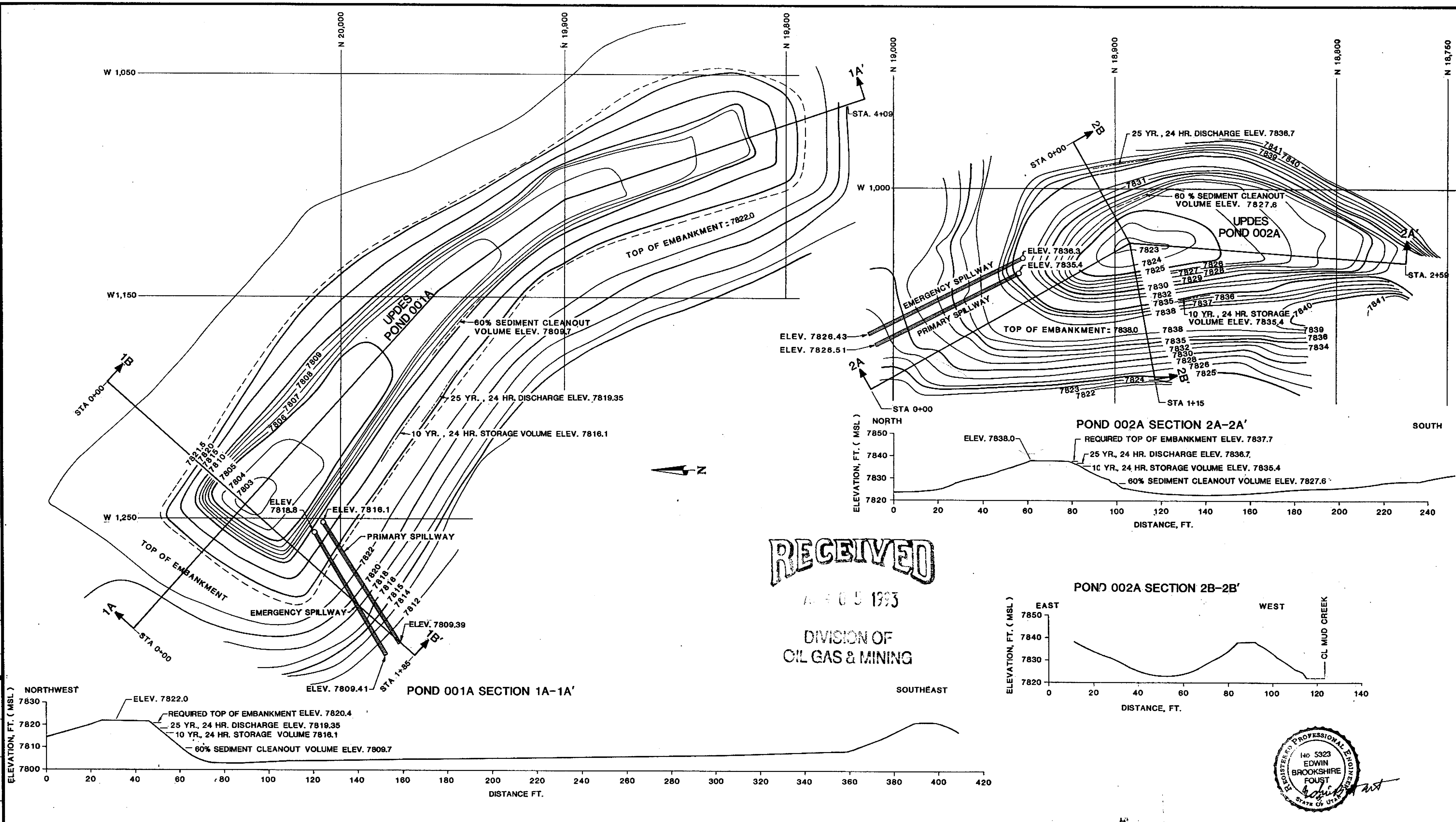
TITLE:
MAP R645-301-731.720c
UPPER BELINA HAUL ROAD
SEDIMENT CONTROL FACILITIES

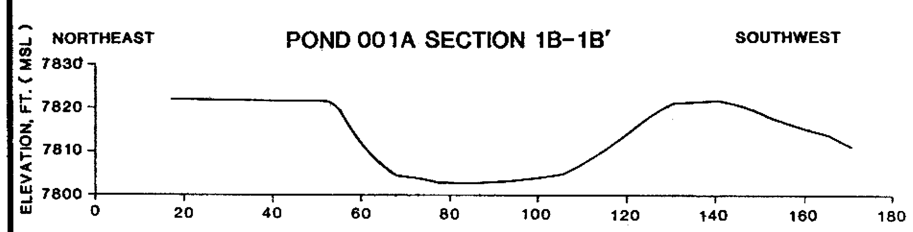
Drawn by: DCR — Date: 8/89
Approval: DEH — Date: 9/90
Drawing No. — Rev. 1 3/93

HANSEN ALLEN & LUCE INC. Salt Lake City Utah

SCALE: 1"=100' — SHEET 1 OF 1

007.11.100.017





CERTIFICATION STATEMENT

I certify that these sediment ponds have been surveyed and that this drawing represents the location, contours, and elevations of each respective pond as of the date shown on this drawing. These ponds are not subject to 30 CFR 77, and are inspected at least four times per year. These ponds are maintained according to the approved plan. This information is true and correct to the best of my knowledge.

VALLEY CAMP OF UTAH, INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

TITLE: FIGURE R645-301-731.750a
SEDIMENT POND 001A AND 002A
SURVEY DETAILS

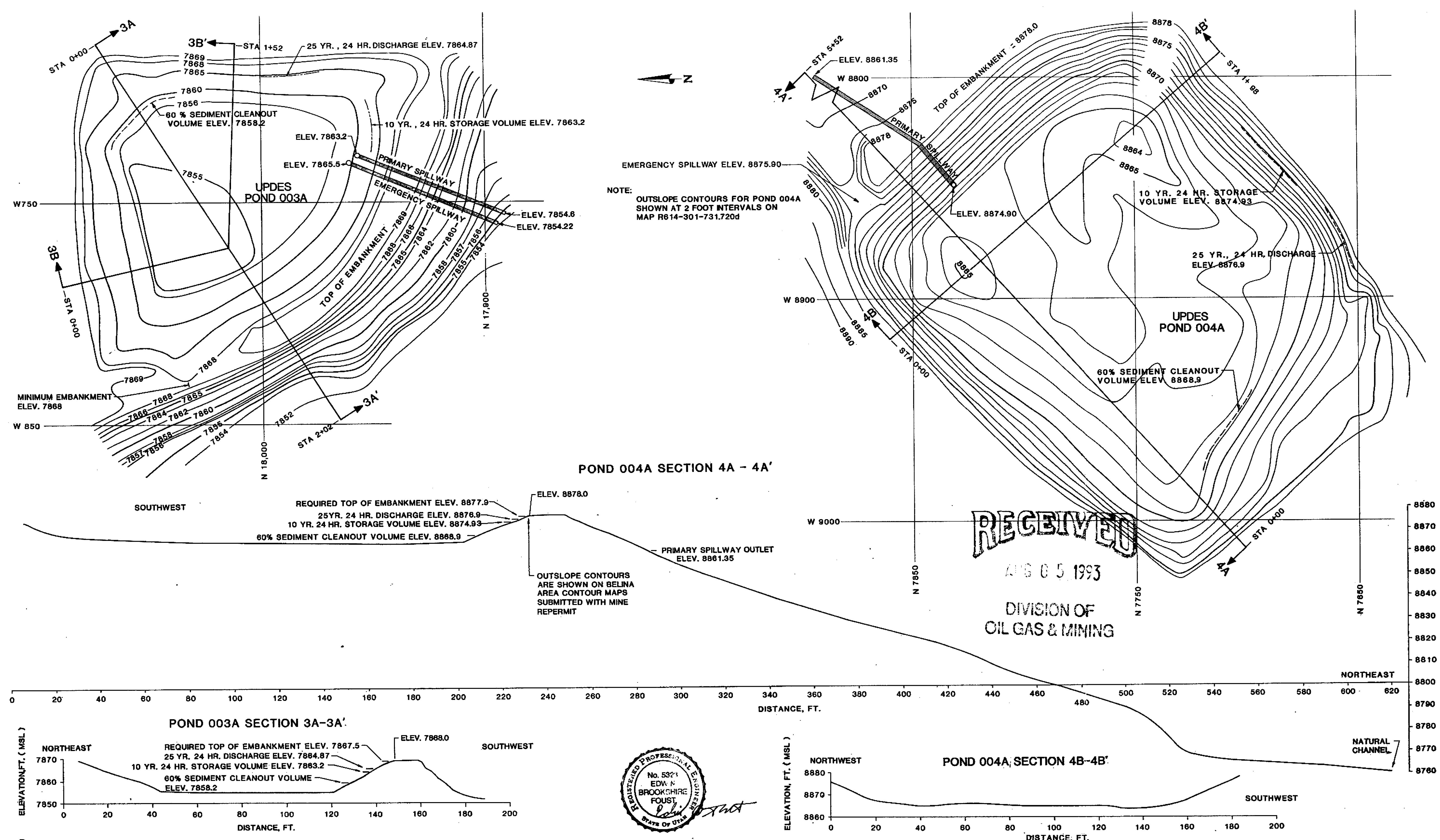
Drawn by: VALLEY CAMP	Date: 7/89		
Approval: DEH	Date: 9/90		
Drawing No.		Rev. 1 3/93	

HANSEN ALLEN & LUCE — Salt Lake City Utah

SCALE: APPROXIMATE SCALE 1" = 20' SHEET 1 OF 1

007.11.100.019

VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



CERTIFICATION STATEMENT

I certify that these sediment ponds have been surveyed and that this drawing represents the location, contours, and elevations of each respective pond as of the date shown on this drawing. These ponds are not subject to 30 CFR 77, and are inspected at least four times per year. These ponds are maintained according to the approved plan. This information is true and correct to the best of my knowledge.

INCORPORATED EFFECTIVE: APR 1 6 1998
UTAH DIVISION OF OIL, GAS AND MINING

VALLEY CAMP OF UTAH, INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

TITLE:
FIGURE R645-301-731.750b
SEDIMENT POND 003A AND 004A
SURVEY DETAILS

Drawn by: VALLEY CAMP	Date: 7/89
Approval: DEH	Date: 9/90
Drawing No.	Rev. 1 3/93

MADSEN, ALLEN & LUCE Salt Lake City Utah

SCALE: APPROXIMATE SCALE 1" = 20'
SHEET 1 OF 1

007.11.100.020

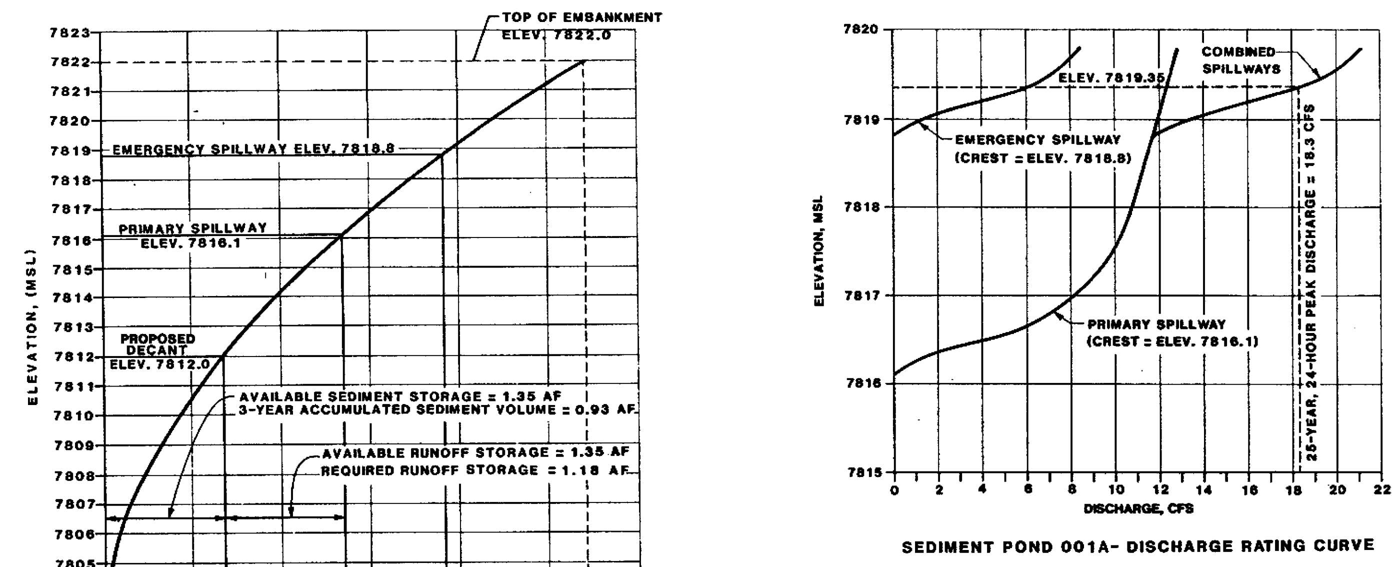
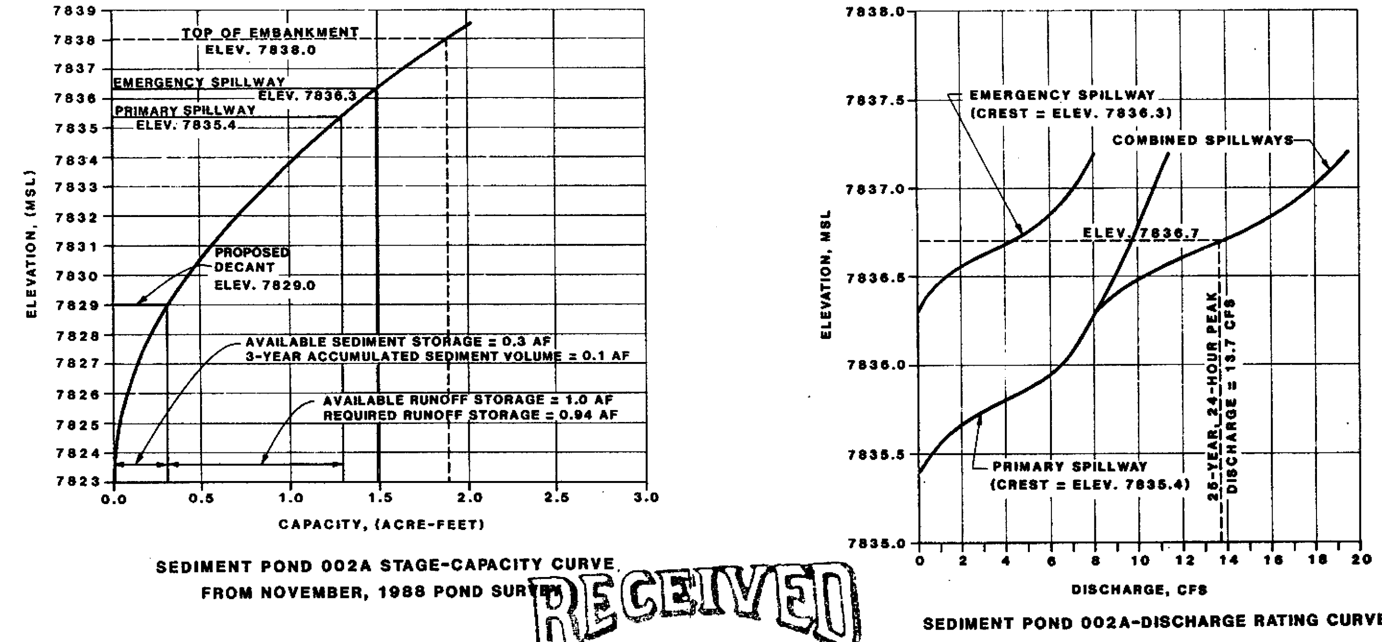


FIGURE 731.750c
POND 001A STAGE-CAPACITY AND
DISCHARGE RATING CURVES



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OIL GAS & MINING

FIGURE 731.750d
POND 002A STAGE-CAPACITY AND
DISCHARGE RATING CURVES

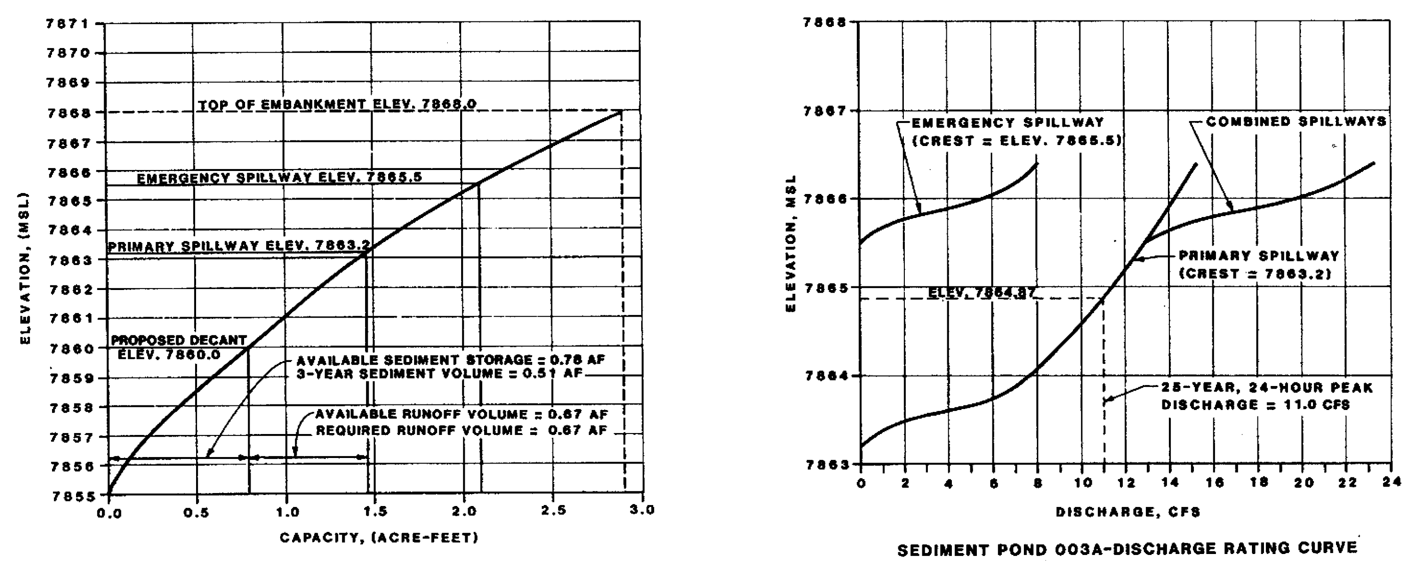


FIGURE 731.750e
POND 003A STAGE-CAPACITY AND
DISCHARGE RATING CURVES

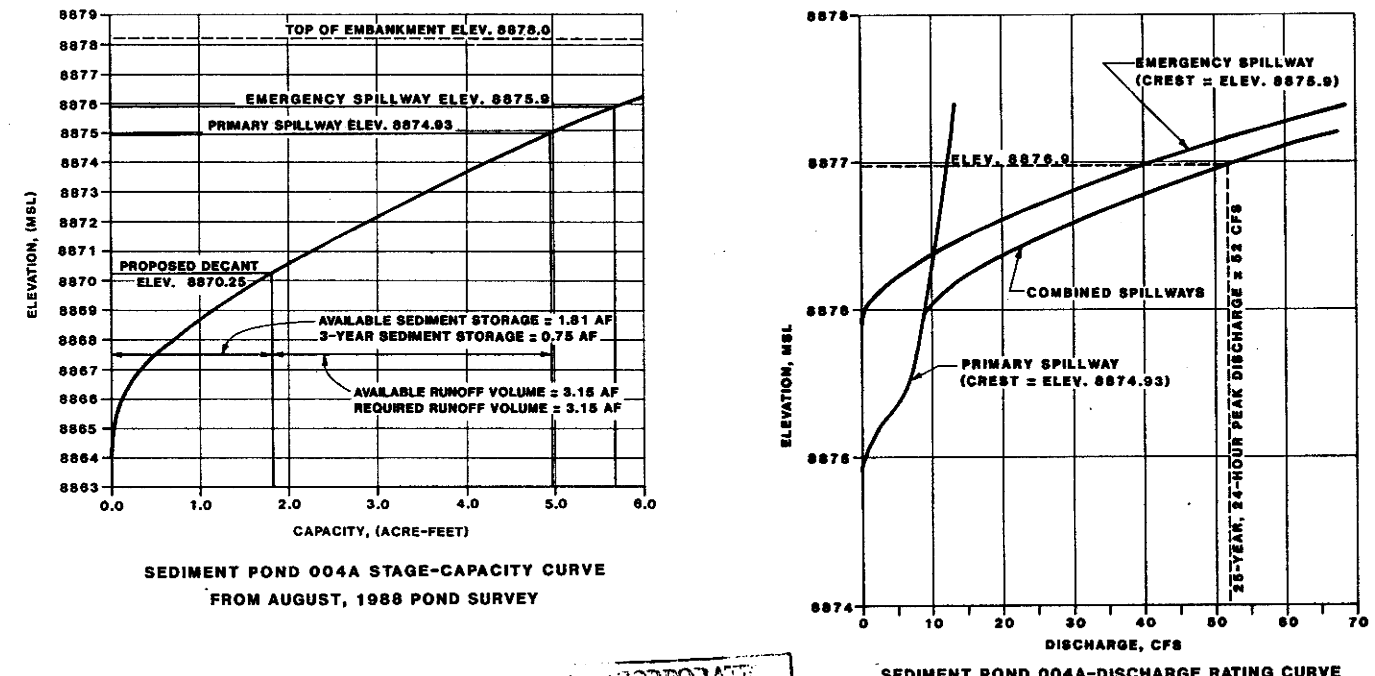


FIGURE 731.750f
POND 004A STAGE-CAPACITY AND
DISCHARGE RATING CURVES

INCORPORATED
EFFECTIVE

HYDROLOGIC CERTIFICATION

I certify that the information contained on this drawing represents true and accurate conditions at the time it was prepared consistent with the level of accuracy obtainable from the data. Information, data, and details provided by the applicant and represented on these drawings is assumed to be true and correct.

#7889
DAVID E. HANSEN
STATE OF UTAH
REGISTERED PROFESSIONAL ENGINEER

VALLEY CAMP OF UTAH, INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

TITLE: FIGURES R645-301-731.750c THROUGH R645-301-731.750f	Drawn by: JVH	Date: 11/89	
	Approval: DEH	Date: 9/90	
	Drawing No.		Rev. 1 3/93
SCALE:	SHEET 1 OF 1		

Salt Lake City Utah

007:11.100022

VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM			VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM			VALLEY CAMP ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS	NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS	NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

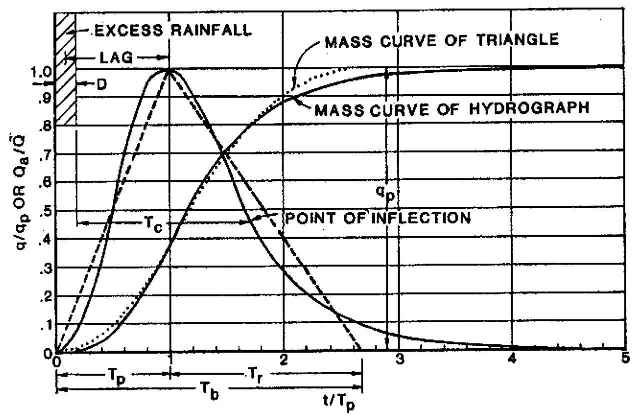
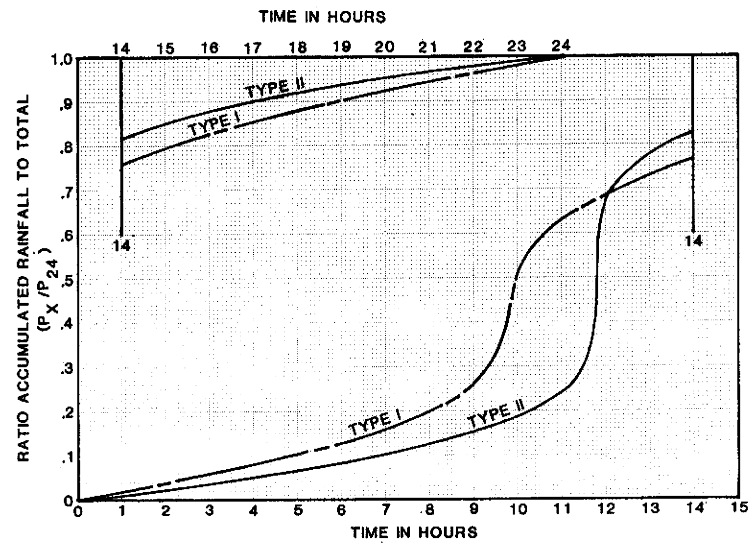


FIGURE 742.221a
DIMENSIONLESS CURVILINEAR UNIT HYDROGRAPH AND EQUIVALENT TRIANGULAR HYDROGRAPH

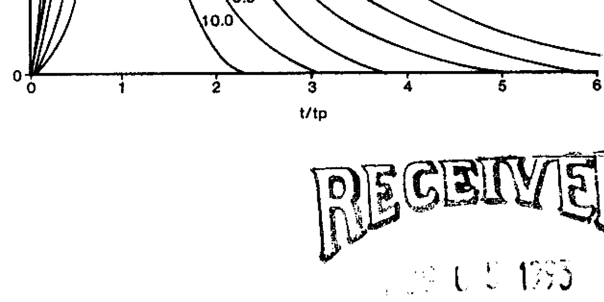


TYPE I HAWAII, COASTAL SIDE OF SIERRA NEVADA IN SOUTHERN CALIFORNIA, AND THE INTERIOR REGIONS OF ALASKA.

TYPE IA STORM DISTRIBUTION REPRESENTS THE COASTAL SIDE OF THE SIERRA NEVADA AND THE CASCADE MOUNTAINS IN OREGON, WASHINGTON, AND NORTHERN CALIFORNIA, AND THE COASTAL REGIONS OF ALASKA. USERS REQUIRING PEAK RATES OF DISCHARGE FOR THESE AREAS CAN OBTAIN THE GRAPHS FROM THE WEST REGIONAL TECHNICAL SERVICE CENTER, SCS, PORTLAND, OREGON.

TYPE II REMAINING UNITED STATES, PUERTO RICO, AND VIRGIN ISLANDS.

FIGURE 742.221b
TWENTY-FOUR HOUR RAINFALL DISTRIBUTIONS



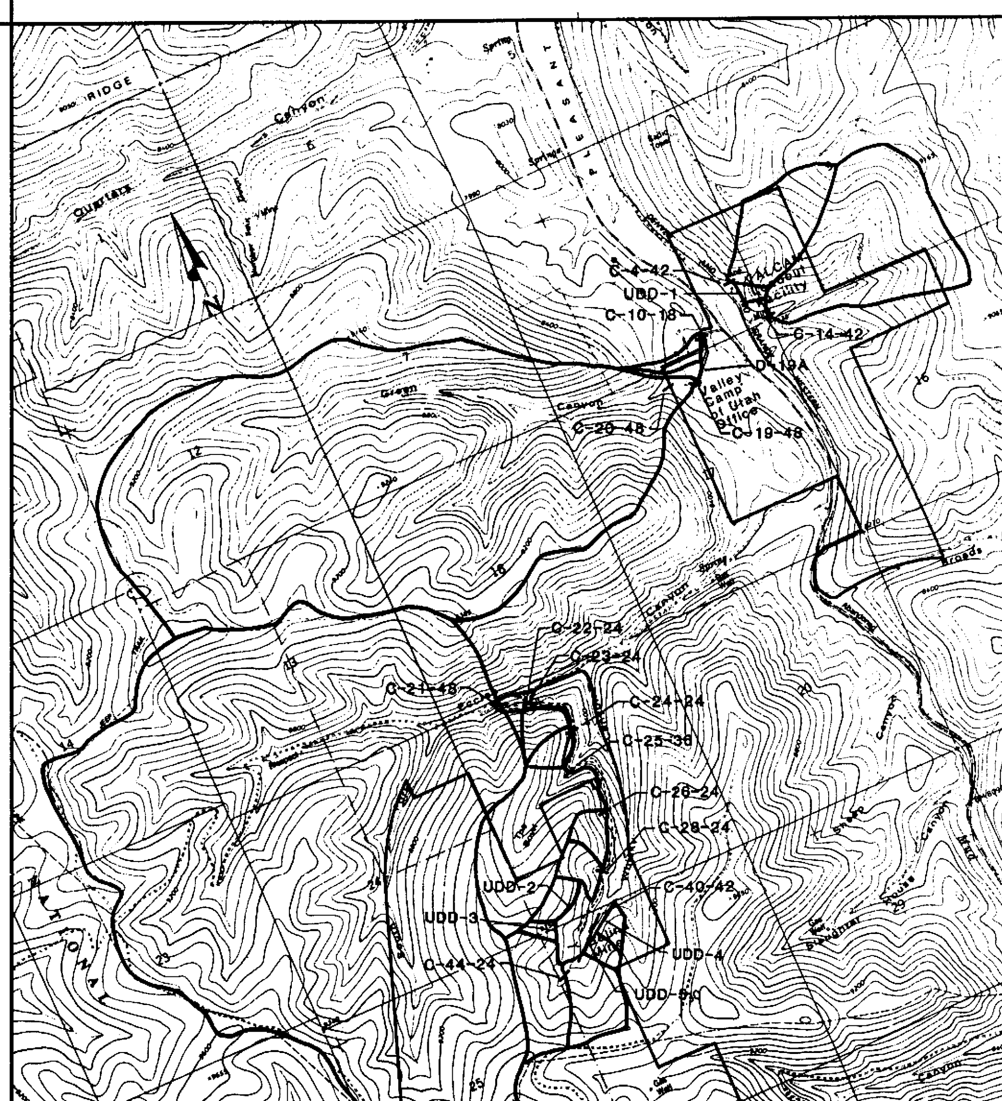
RECEIVED

DIVISION OF OIL GAS & MINING

FIGURE 742.221c
VARIATION IN HYDROGRAPH SHAPE WITH VARIATION IN C_3t_p (TAKEN FROM HAAN, 1970)

INCORPORATED EFFECTIVE

UTAH DIVISION OIL GAS AND MINING



NOTE:
DRAINAGE BASINS IDENTIFIED BY DITCH OR CULVERT AS APPROPRIATE.
SEE CALCULATIONS FOR BASIN CRITERIA.

MAP 742.310a
DRAINAGE BASIN BOUNDARIES FOR SELECTED LARGE WATERSHEDS

LEGEND
SEE LOWER LEFT CORNER

SCALE:1"=2000'

LEGEND: (MAP 742.310a)

C-25-36	CULVERT 25 (36 INCH DIAMETER)
D-19A	DITCH 19A
~	DRAINAGE BASIN BOUNDARY
UDD-2	UNDISTURBED DRAINAGE DITCH - 2

HYDROLOGIC CERTIFICATION

I certify that the information contained on this drawing accurately represents hydrologic analyses and methodology completed for this permit renewal as per standard engineering practice.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID E. HANSEN STATE OF UTAH

VALLEY CAMP OF UTAH, INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

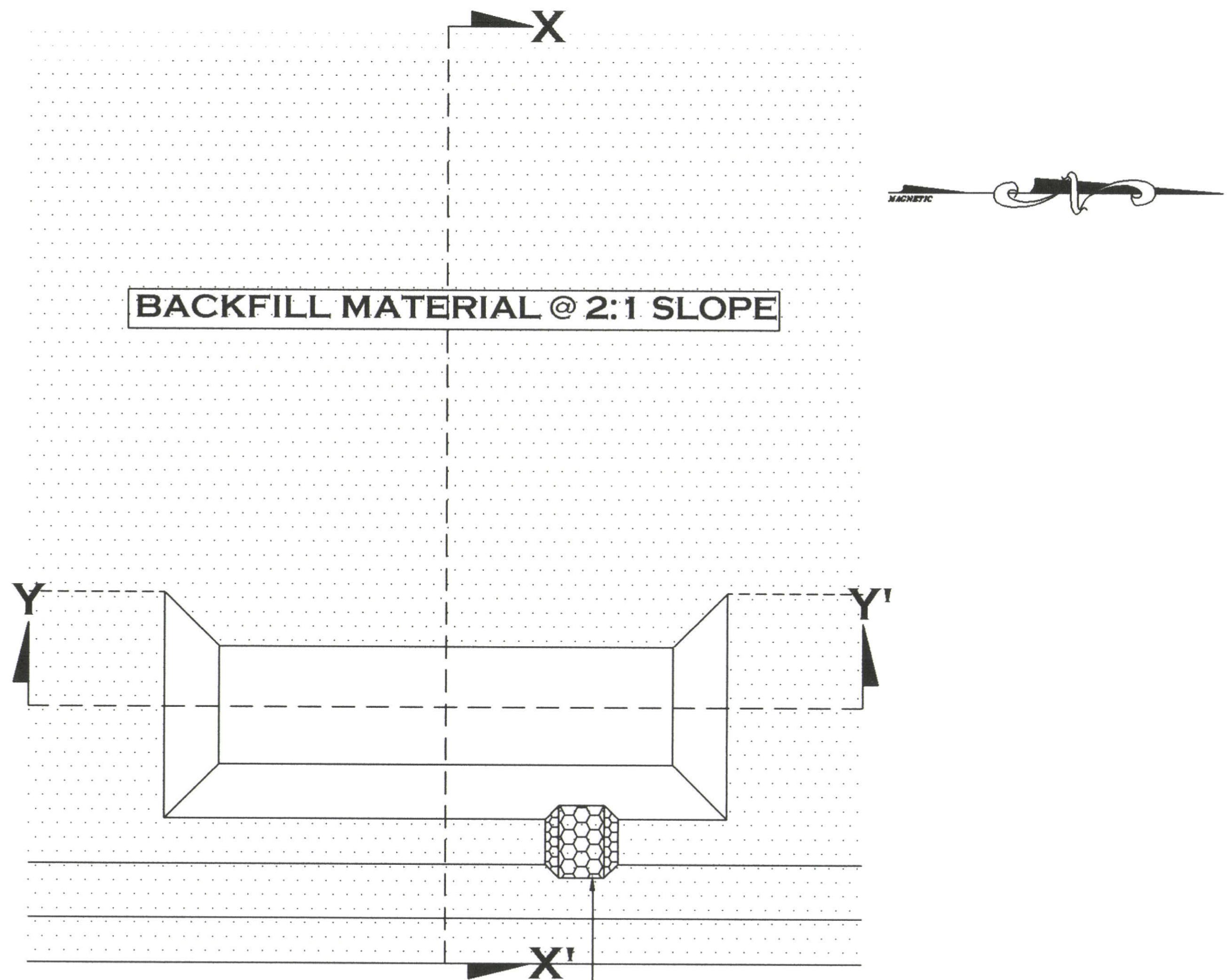
TITLE:	Drawn by: DCR	Date: 8/89
FIGURES R645-301-742.221a THROUGH R645-301-742.221c AND MAP R645-301-742.310a	Approval: DEH	Date: 9/90
	Drawing No.	Rev. 1 3/93

HANSEN ALLEN & LUCE INC. Salt Lake City Utah

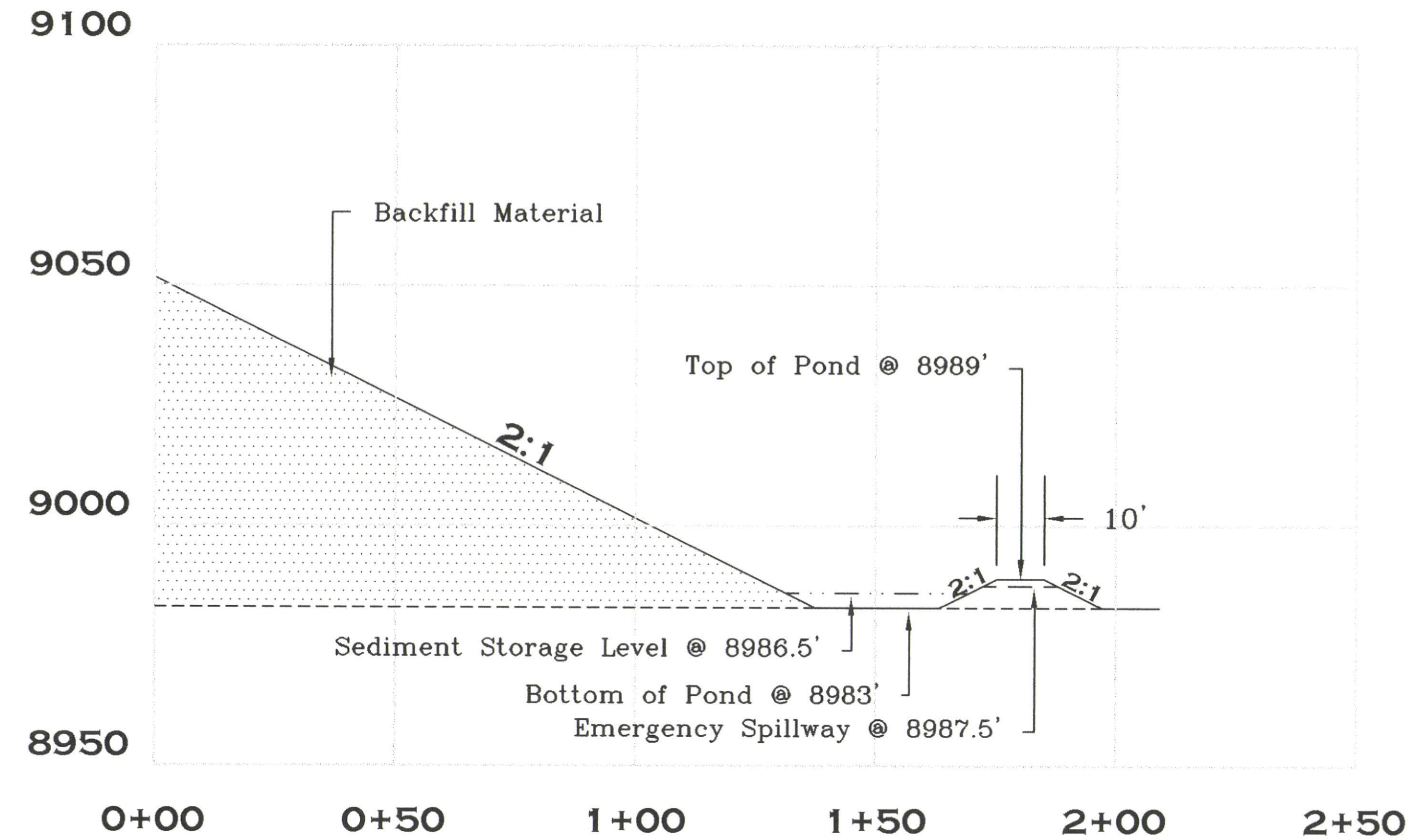
SCALE: AS SHOWN

SHEET 1 OF 1

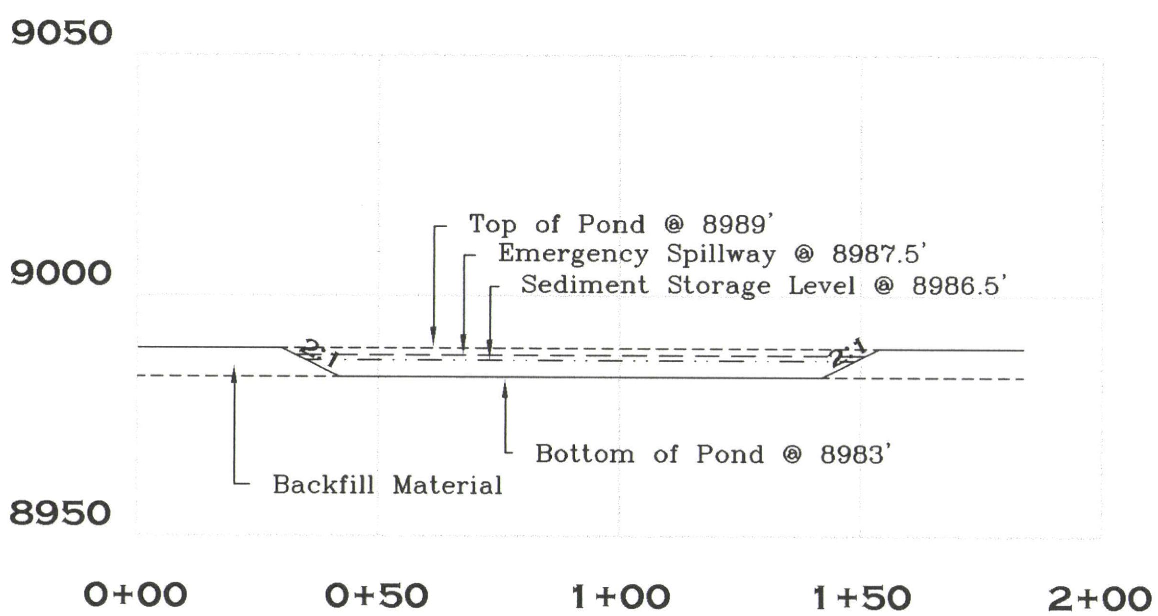
007.11.100.021



PLAN VIEW



PROFILE X-X'



CROSS SECTION Y-Y'

INCORPORATED

OCT 2 6 2001

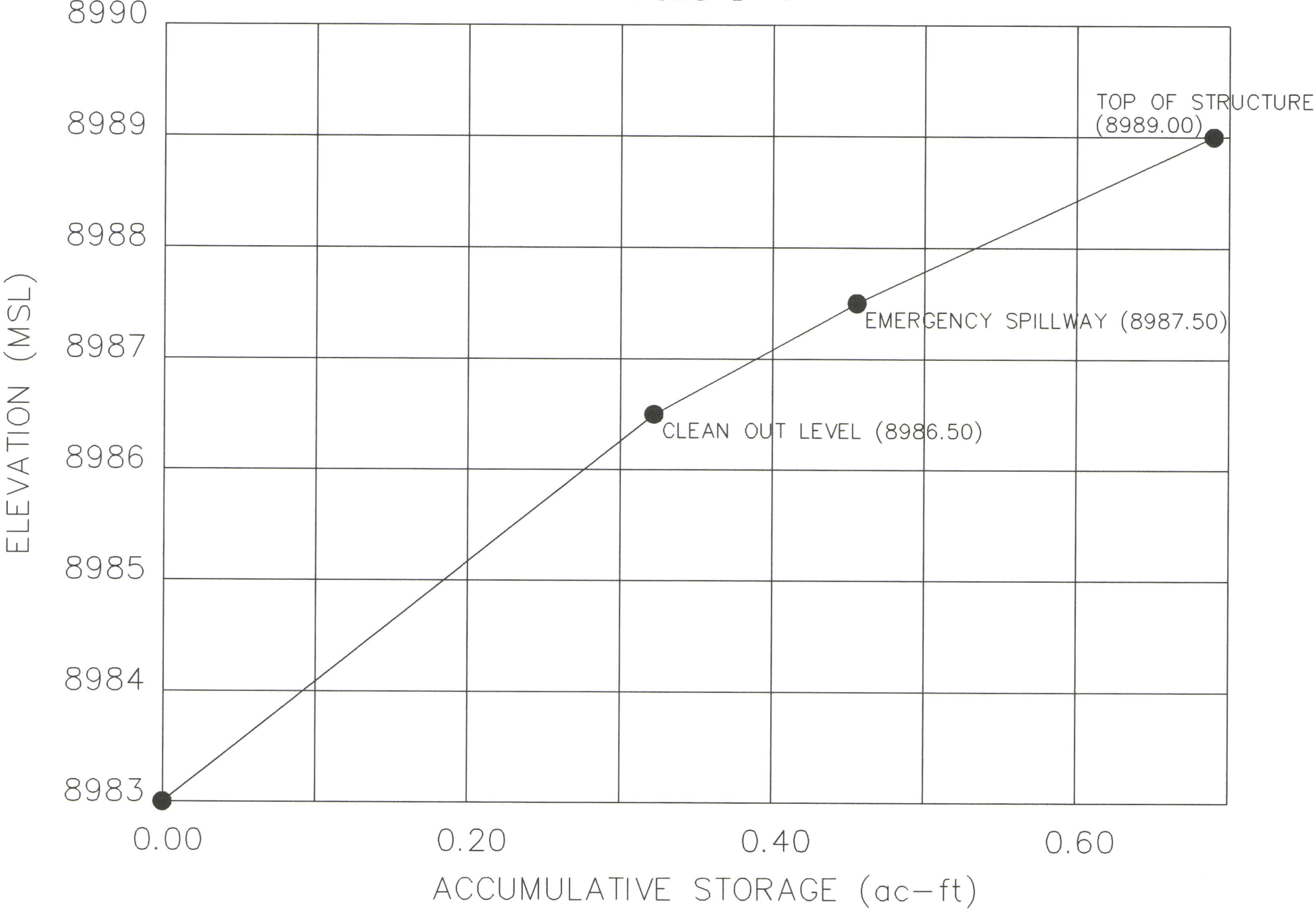
DIV OF OIL GAS & MINING

REGISTERED PROFESSIONAL ENGINEER
No. 7418
David B. Miller
8/27/01
STATE OF UTAH

Lodestar Energy, Inc. Mountain Operations White Oak Mining Sediment Structure D-1 Design Views R645-301-731.750g			SUMMIT ENGINEERING, INC. 101 Summit Drive, Pikeville, KY 41501 (606) 432-1447 Pikeville, KY Grundy, VA Logan, WV Charleston, WV
DATE: 8/13/01	REV. DATE	SCALE: 1" = 40'	PER. NO:
FILENAME: Pond D-1.dwg	DISK NO:	PLOT DATE:	ATT:
DRAWN BY: MJP	CHK BY: MJP	APPRVD. BY: MJP	PAGE NO:

STAGE STORAGE CURVE

Pond D-1



STORAGE VOLUME COMPUTATIONS

Pond D-1

ELEV. (ft)	WIDTH (ft)	LENGTH (ft)	AREA (ac)	AVG. AREA (ac)	INTERVAL (ft)	STORAGE (ac-ft)	ACC. STORAGE (ac-ft)	STAGE INTERVAL (ft)
8983.00	N/A	N/A	0.0600					
8986.50	N/A	N/A	0.1242	0.0921	3.50	0.3223	0.3223	3.50
8987.50	N/A	N/A	0.1425	0.1333	1.00	0.1333	0.4556	4.50
8989.00	N/A	N/A	0.1700	0.1563	1.50	0.2344	0.6900	6.00

INCORPORATED
OCT 26 2001
DIV OF OIL GAS & MINING

REGISTERED PROFESSIONAL ENGINEER
No. 7418
DAVID B. MILLER
10/16/01
NOT VALID WITHOUT A SIGNATURE
STATE OF UTAH

LODESTAR ENERGY, INC.
MOUNTAIN OPERATIONS

HC 35 BOX 370 HELPER, UTAH 84526

TITLE: DUGOUT POND D-1 STAGE-CAPACITY CURVES

SIZE: B | DRAWN BY: RR LODESTAR ENGINEERING | DWG NO.: C:\Rick\WhiteOak\ Pond D-1 Capacity Chart.dwg | REV.

Scale: NTS | Date: Oct. 09, 2001 | FIGURE: R645-301-731.750H